Tohl Naw 16/7-2016

CUSTOMER ENGINEERING SERVICE

Confidential House Publication
Provisional Edition

EPD5V6

olivetti PROGRAMMA 101 technical manual

OA-EC-P2
Revised January, 1971

Order From: Ernie Jorgenson
Office Machine Americana
1740 Birch Ave. 208-746-8325
Lewiston, Idaho 83501

P101

olivetti PROGRAMMA 101 technical manual

SCOPE

This manual is concerned only with the mechanical units and the electrical wiring in the machine. The functioning of the electrical and electronic units is dealt with in a separate manual.

This Manual is organized by chapter to correspond with the P-101 Technical Training System which divides the computer into major functional areas. Each chapter deals with specific functions within these areas. Where appropriate, these functions are further broken down into:

- Operating theory
- Adjustments
- Inspection Procedures

This type of organization should enable the reader to locate desired information quickly and easily.

All correspondence pertaining to this Manual should be directed to:

Olivetti Corporation of America
Accounting & Computing Machines
Technical Section
New York, New York

Foreword

The PROGRAMMA 101 is an electronic desk top computer containing a number of modular units which can be removed individually from the machine.
Each unit is mechanically independent of the other, with the exception of the mechanical drive transmission units. All linkages are entirely contained within their own units and do not have any connection with linkages belonging to the other units.

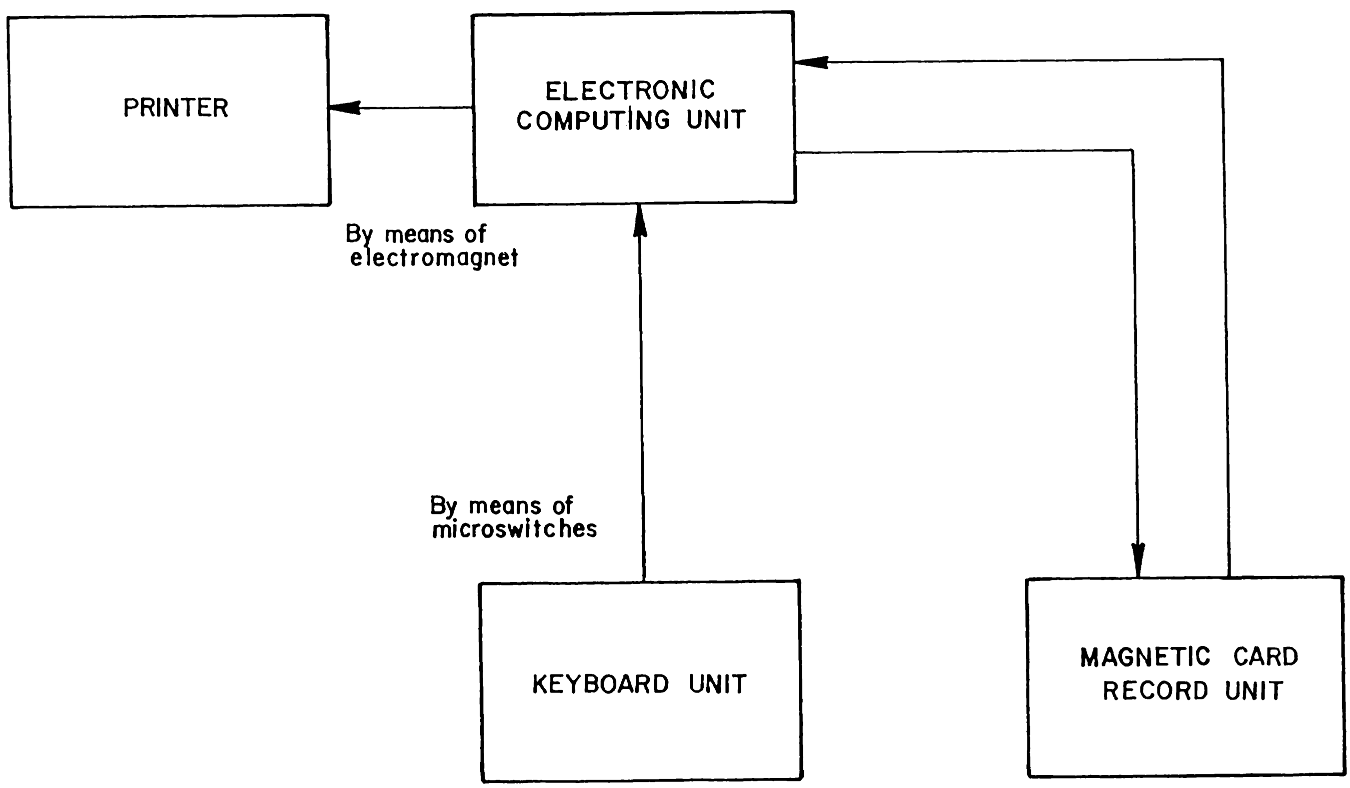
The computer is divided into two major functional areas each consisting of the following modular units:

Electrical	Mechanical
- POWER SUPPLY	-MOTOR UNIT
- ELECTRONIC COMPUTING UNIT	- KEYBOARD UNIT (KEYS, ENTRY CLUTCH, ENCODER)
- DECIMAL WHEEL UNIT	- PRINTER
- PROGRAM SWITCH UNIT	- RIBBON OPERATION UNIT
- PRINTING HAMMER CONTROL UNIT	- MAGNETIC CARD READ/ RECORD UNIT

Before studying the linkages within the individual modules, we should first examine how the units are related to each other, and what is the order of command which actuates the units themselves.
The Electronic Computing Unit can be operated manually by the operator, through the Keyboard Unit, or automatically by means of an internally stored program.
The Keyboard Unit and Read/Record Unit are the units feeding signals to the "Electronic Computing Unit" and are called input units.
The "Electronic Computing Unit, " in response to the commands sent to it either manually or automatically actuates the "Printer" which is called an output unit.
The Read/Record Unit can also be considered an output unit, since in addition to accepting instructions from a program card, it can also carry out the reverse operation and record instructions and numbers on the card.
The Paper Advance Unit is part of the Printer, and is therefore, actuated at the same time as the printer, by the Electronic Computing Unit.
The transducers used to enable commands to be passed from the Electronic Computing Unit and the Mechanical Units are of two types:

- Microswitches (used by the mechanical units to pass the instructions to the Electronic Unit).
- Electromagnets (used by the Electronic Units to control the mechanical units.

The diagram on the opposite page illustrates this.


PRINTER
ELECTRONIC COMPUTING UNIT
By means of electromagnet
By means of microswitches
KEYBOARD UNIT
MAGNETIC CARD RECORD UNIT

P 101 TECHNICAL MANUAL

CONTENTS

CONTENTS - CONTINUED

CONTENTS - CONTINUED

CONTENTS - CONTINUED

SECTION 1
MECHANICAL POWER DISTRIBUTION

1. MECHANICAL POWER DISTRIBUTION

1. Introduction

Whenever the P101 is turned on, electric power is supplied to the Motor and to the computer Power Supply.

The Motor drives the cooling fan for the Electronic Computing Unit and the Power Supply, and also provides the mechanical power to rotate the Servomechanism Main Shaft, the Card Drive Shafts and the Print Unit.

2. Operation: Refer to Figure 1

To provide cooling for the Electronic Computing Unit, the Fan (1) is driven by the right pulley of the Motor by means of a round Rubber Belt (2).

The Motor (M) drives the Servo Shaft (3) by means of a V-belt and double pulley (4).

Both drive shafts (5) and (6) in the card section are powered from the double Pulley (4) by means of a flat fabric Belt (7), which is kept tight by the tensioning roller assembly (8).

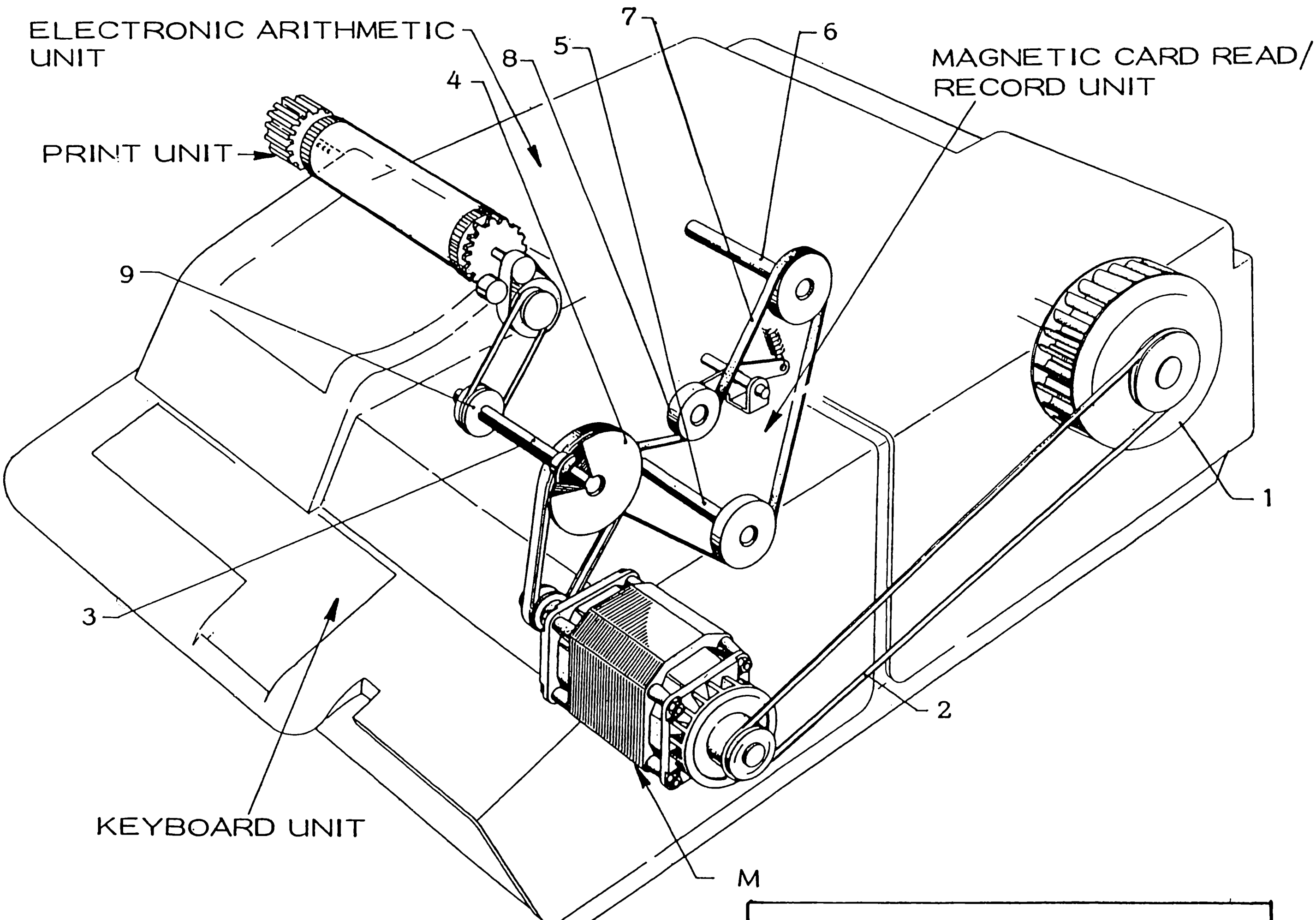
The Printer receives its mechanical power from the left end of the Servo Shaft (3) by means of the small Pulley (9).

3. Adjustments: Refer to Figure 1

Left Motor Pulley: Loosen the two set screws on the left Motor Pulley. Align the left Motor Pulley with the Servo Pulley (4) then tighten both Set Screws on the left Motor Pulley. Check tension of V-belt by pressing against its surface midway between the pulley wheels. It should be possible to push the V-belt inward from 1/8" to 1/4". If necessary, re-position Motor Mountings until proper Belt tension is obtained.

Fan Belt: Refer to Figure 1 Detail A: Check to see that the Rubber Belt (2) does not strike the Plastic Fan Housing (12) on the right side of the Motor. If necessary, loosen the Set Screws (9) on the Motor Fan (11) and move the Motor Fan outward on the Motor Shaft (10). The Set Screws are accessible from the bottom of the Plastic Fan Housing through the air intake slot as shown. Tighten the Set Screws and turn the machine on to check if further adjustment is required.

Oily Drive Belts should be cleaned with soap and water. If any nicks or cuts show on the round Rubber Belts, they must be replaced. The V-Belt should be replaced only if slippage occurs due to stretching or excessive wear.



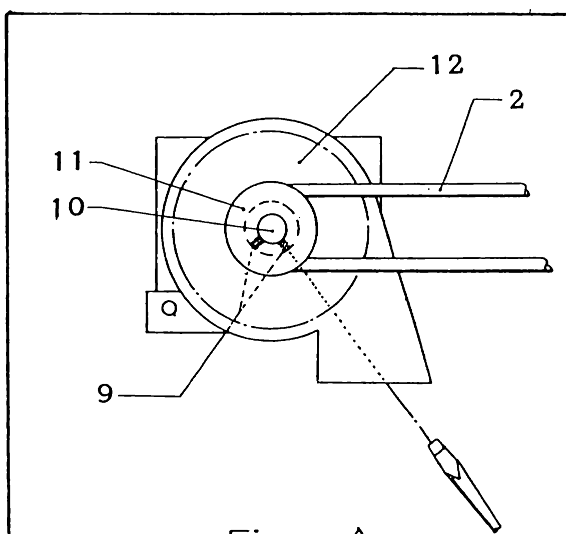


Figure A

MECHANICAL POWER DISTRIBUTION

Figure 1

SECTION 2

KEYBOARD UNIT (KEYS, ENTRY CLUTCH, ENCODER)

II. KEYBOARD UNIT

A. Introduction and Coding System

The Electronic Computing Unit performs computations using a binary code. For this reason, the computer must have a coding device able to translate decimal and symbolic data, that are manually entered by the operator, into binary coded electrical signals which the Electronic Computing Unit can "understand."

This is accomplished by activating a set of microswitches through the Keyboard. Each Key calls for a different configuration of microswitch settings.

The following mechanisms perform this function:

- The Entry Mechanism through which the operator enters operation, addresses and numeric information into the Keyboard. The Entry mechanism determines the microswitch setting corresponding to the data entered. It also activates the Servomechanism.

- The Servomechanism supplies the mechanical power required to set the microswitches in the desired configuration.

- The Encoder produces the necessary binary coded electrical signals, representing quantitative data and the location of that data, by means of the 6 Microswitches AA, AB, AC, AD, AE and AF.

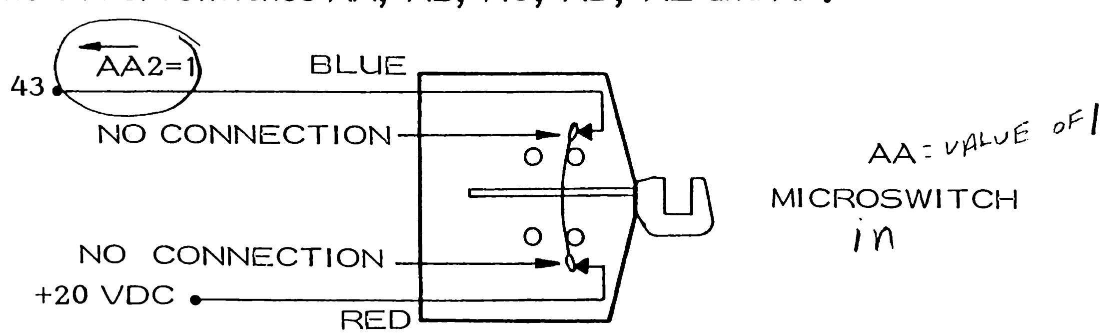


Figure 2

We will now consider how decimal or ordinary numbers are converted into binary codes:

Figure 2 shows one of the Encoder Microswitches (AA) in its rest position (plunger in). This microswitch produces only one signal, AA2, in the rest position. This means that AA2 is at level 1. If we were to use a meter to check this condition, a reading of +20 VDC would be obtained from wire number 43 on the Electronic Computing Unit to ground. This reading represents the level 1.

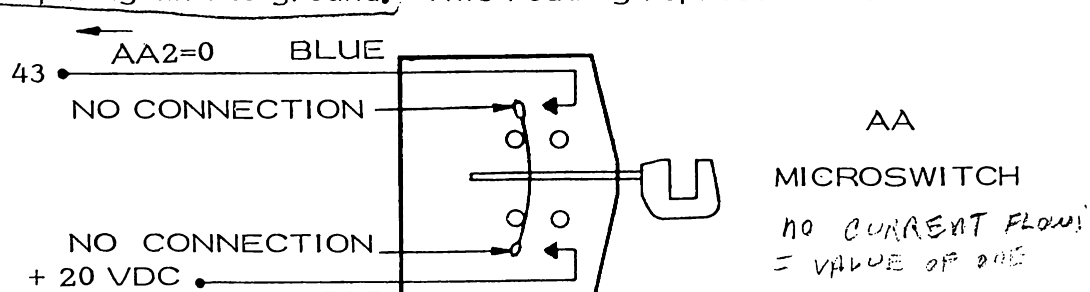


Figure 3

By entering the number one (1) on the Keyboard, the AA microswitch plunger will be pulled out as shown in Figure 3. The signal AA2 is now at level 0. It is the absence of AA2 (level 0) that permits the binary equivalent of the number one (1) to enter the Electronic Computing Unit. The above is also true for microswitches AB, AC & AD.

In conclusion, the microswitch vocabulary consists of two words: zero and one. The resulting code is called binary because it uses only these two words.

The Electronic Computing Unit is capable of distinguishing between the two levels and therefore can "read" the position of the microswitch.

In order to be able to count from 0 to 9 in binary code, we need to have 4 microswitches. Further, the Electronic Computing Unit must be instructed to recognize as a 1, 2, 4 and 8 the signals of the first, second, third and fourth microswitch respectively.

If we now set all four microswitches in the appropriate configuration, we can count from 0 to 9 as follows: REST POSITION SWITCH PLUNGER IS IN " " OUT ACTIVATED

AD (8)	AC (4)	AB (2)	AA (1)	
0	0	0	0	=0
0	0	0	1	=1
0	0	1	0	=2
0	0	1	1	=3
0	1	0	0	=4
0	1	0	1	=5
0	1	1	0	=6
0	1	1	1	=7
1	0	0	0	=8
1	0	0	1	=9

Thus we have the ability to represent in binary any number 0 through 9 that the operator will enter.

With the addition of two more microswitches, AE and AF, the operator can now enter three different types of Keyboard data:

- -numbers. . . . . quantities
- -address. . . . . location of the quantities
- -operation. . . . . manipulation of the quantities

The microswitch binary coding configurations which permit identification of each data type are as follows:

AF	AE	
0	0	=Number
1	1	=Address Symbol
1	0	=Operation Symbol

In addition to the code provided by the position of AE and AF microswitches, a numerical weight is also assigned to each possible operation or address. Since there are 16 operations possible on the P101, it is necessary for the numerical weight provided by the microswitches AA through AD to identify all entries. The microswitch coding chart shows the count expanded (0-15) which will identify all possible entries.

There are also several special functions which must be represented by separate microswitches. These are:

- -decimal point (AV)
- -negative sign (AM)
- -clear entry (AN)
- -general reset (AG, AT)
- -accept entry (AK)

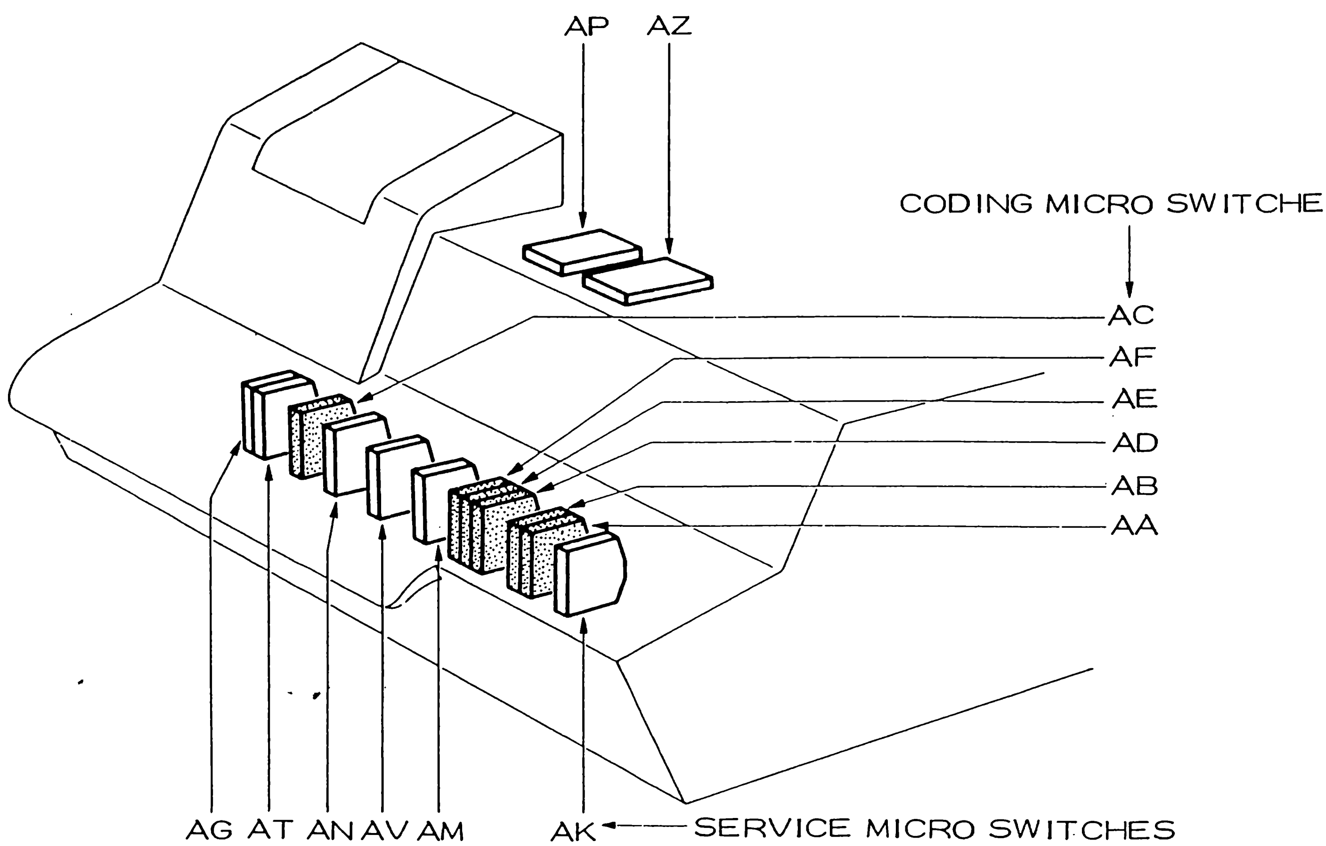
When the plunger of each microswitch is pulled out, the corresponding service codes are sent to the Electronic Computing Unit. The action or operation called for by each code is then performed.

In addition to the above list of Keyboard controlled functions, switches AP and AZ, mounted on the Servomechanism, directly condition the operation of the Electronic Computing Unit according to their settings. They are used to:

- -record a program on the card (AP)
- -print a program stored in the memory (AZ)
- -read, record or print register D and E only (AP & AZ together)

If we now assemble the foregoing ideas the result is expressed in the table shown on the opposite page.

*Note: On older model machines the AC Microswitch is located between AB and AD Microswitches.



AK(
AE)

Figure 4

K Shift Key Controls Printing

KEY	MICROSWITCHES											
	AG	AT	AN	AV	AM	AF	AE	AD	AC	AB	AA	AK
0	0	0	0	0	0	0	0	0	0	0	0	1
1	0	0	0	0	0	0	0	0	0	0	1	1
2	0	0	0	0	0	0	0	0	0	1	0	1
3	0	0	0	0	0	0	0	0	0	1	1	1
4	0	0	0	0	0	0	0	0	1	0	0	1
5	0	0	0	0	0	0	0	0	1	0	1	1
6	0	0	0	0	0	0	0	0	1	1	0	1
7	0	0	0	0	0	0	0	0	1	1	1	1
8	0	0	0	0	0	0	0	1	0	0	0	1
9	0	0	0	0	0	0	0	1	0	0	1	1
C	0	0	0	0	0	1	1	0	0	0	1	1
R	0	0	0	0	0	1	1	0	0	1	0	1
D	0	0	0	0	0	1	1	0	0	1	1	1
A	0	0	0	0	0	1	1	0	1	0	0	1
B	0	0	0	0	0	1	1	0	1	0	1	1
F	0	0	0	0	0	1	1	0	1	1	0	1
E	0	0	0	0	0	1	1	0	1	1	1	1
/	0	0	0	0	0	1	1	1	0	0	0	1
S	0	0	0	0	0	1	0	0	0	0	0	1
↓	0	0	0	0	0	1	0	0	0	0	1	1
↑	0	0	0	0	0	1	0	0	0	1	0	1
⬍	0	0	0	0	0	1	0	0	0	1	1	1
+	0	0	0	0	0	1	0	0	1	0	0	1
−	0	0	0	0	0	1	0	0	1	0	1	1
x	0	0	0	0	0	1	0	0	1	1	0	1
÷	0	0	0	0	0	1	0	0	1	1	1	1
◊	0	0	0	0	0	1	0	1	0	0	0	1
*	0	0	0	0	0	1	0	1	0	0	1	1
√	0	0	0	0	0	1	0	1	0	1	1	1
V	0	0	0	0	0	1	0	1	1	0	0	1
W	0	0	0	0	0	1	0	1	1	0	1	1
Y	0	0	0	0	0	1	0	1	1	1	0	1
Z	0	0	0	0	0	1	0	1	1	1	1	1
GEN.	1	0	0	0	0	0	0	0	0	0	0	0
RESET	0	1	0	0	0	0	0	1	1	0	1	1
CLEAR ENTRY	0	0	1	0	0	0	0	1	1	0	0	1
DEC. (.) POINT	0	0	0	1	0	0	0	1	0	1	0	0
NEG. (-) SIGN	0	0	0	0	1	0	0	1	0	1	1	0

B. Encoder

1. Operation: Refer to Figure 5

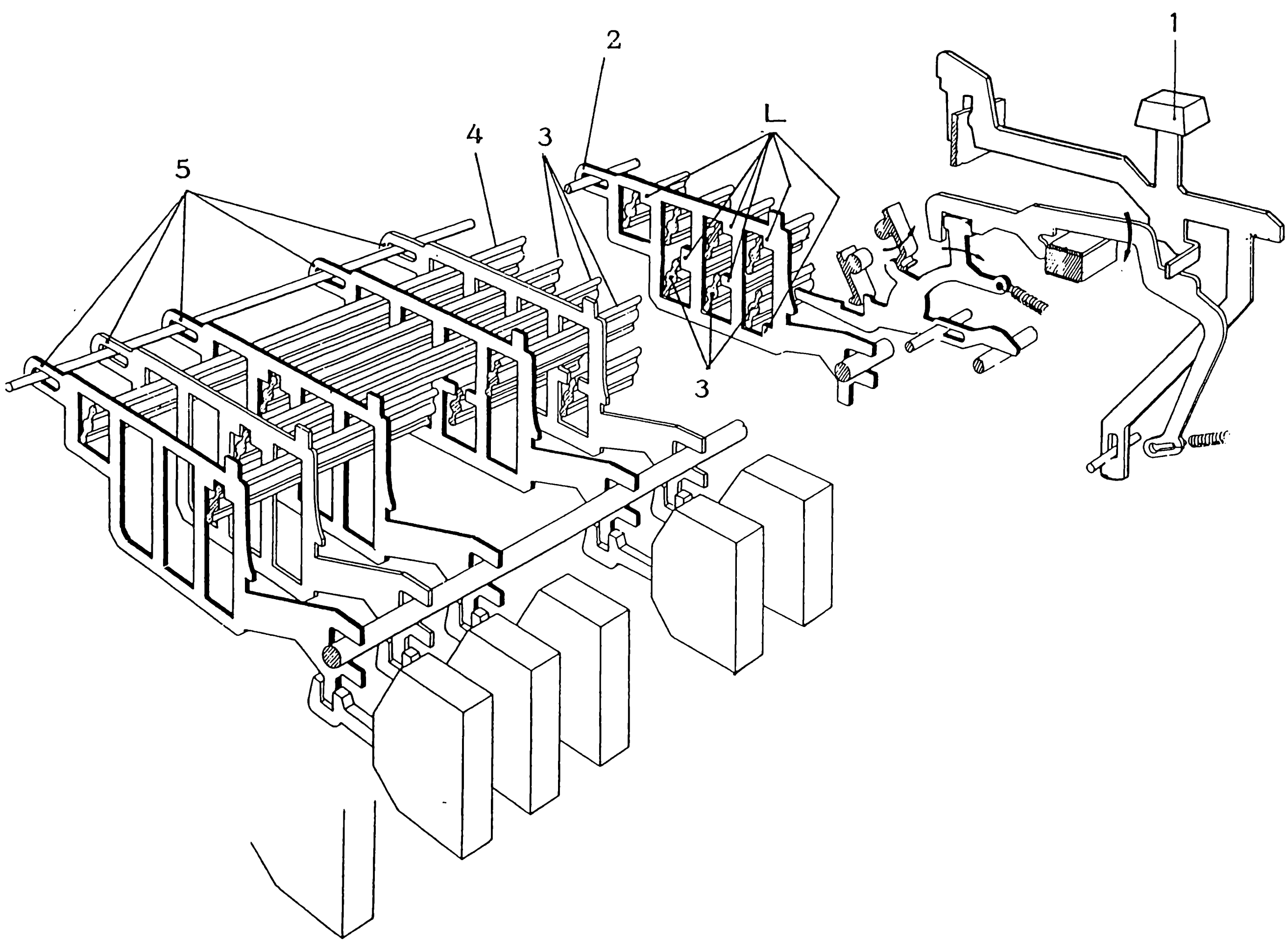


Figure 5

The Encoder converts the decimal data entered on the Keyboard into binary coded electrical signals.

When a key (1) is depressed, a sequence of part movements (described in the next section) occurs which pushes the corresponding Coding Bar Slide (2) to the rear.

There is a Coding Bar Slide for every Keyboard Key: each has a different combination of Actuating Lugs L depending upon the binary code corresponding to the specific Key.

When the Coding Bar Slide moves to the rear, Lugs L cause the rotation of the Coding Bars (3). There are 7 Coding Bars: one for each of the Encoder signals (3) and one for the AK signal (4).

The direction in which the Coding Bars are rotated depends upon the position of each actuating Lug on the Slide. Actuating a Coding Bar Slide that has no Lug in a given slot willimpart no rotation to the Coding Bar passing through that slot. This is the case with the AK Coding Bar (4) in connection with the following three functions: Fig. 5

-Decimal Point (.)
-Negative Sign (-)
-The first cycle of Reset ALL

Each of the 6 Coding Bars (3) controls one of the Microswitch Slides (5) which in turn control the 6 Microswitches AA-AF. (The function of the AK Coding Bar (4) is discussed later on).

As the Coding Bars rotate, each Microswitch Slide (5), which has actuating Lugs facing a moving Bar, will be pushed in the direction of Coding Bar rotation. By this means, the required setting (plunger in or plunger out) of each Microswitch is obtained.

2. Adjustments: Refer to Figure 6

(a) Encoder: Raise the Keyboard. Loosen four screws "C" found on the right and left sides of the Keyboard Mainframe (1). Adjust the position of the Encoder (2) by gently moving it downward as far as possible. This assures that maximum rearward (upward with Keyboard raised) movement of the Coding Bar Slides (3) will be obtained from the rearward motion of the Key Lever Latches (4). Tighten screws "C". NOTE: Performing this adjustment makes it necessary ti inspect the Microswitch Slide fingers "A" as described in 3b.
Readjustment may be necessary.

(b) Microswitches: If all the Microswitch Plungers (B) are not aligned, back off the appropriate screw (D) a small amount to loosen the proper Microswitch Bracket (5) from the Microswitch Mounting Plate (6). Adjust so that the affected Plunger is in perfect alignment with the other Plungers. Tighten the screw.

To adjust clearances "L" and "L1", the entire Microswitch assembly must be moved. This is done by loosening the two screws (not shown) that fasten the Microswitch Mounting Plate (6). Adjust to obtain the visual clearances as shown in Figure 6 then tighten the screws carefully to prevent Plate Slippage.

If all the Plungers are aligned, check that clearances "L" and "L1", shown on Figure 6 are present by viewing as before and manually cycling the Servo for several entries. No measurements are required to establish this visual clearance, but an attempt should be made to obtain an equal amount of clearance between all Slide fingers "A" and their associated nylon Plungers (B). If necessary, readjust the position of the Encoder to equalize clearances "L" and "L1".

3. Inspection: Refer to Figure 6

(a) If the Encoder (2) is suspected to have shifted from its normal position, raise the Keyboard, depress any Operation Key and check that the Coding Bar Slides (3) and Microswitch Slides (7), which move upward when the Servo Pulley is rotated by hand, travel a distance that is not less than 1/8 inch. Should the amount of Slide travel at maximum upward displacement be less than 1/8 inch, the Encoder must be adjusted downward, as described in 2a above, in order to re-establish the proper condition. Proper upward Slide displacement can be checked by observing that the Coding Bar Slide moves a distance at least equal to the depth of web "E".

(b) Microswitches:
It is important for proper operation of the Microswitches that small amounts of clearance L & L1 exist between Microswitch Slide finger "A" and the nylon part of Plunger (B). After checking the Coding Bar Slide stroke as outlined in (3a) enter a zero (0) and rotate the Servo-mechanism through a complete entry cycle. All the Microswitch Plungers (B) must be aligned with each other and be in the rest (IN) position when viewed through the right side of the Keyboard. A good light source is required to effectively perform this check. A Microswitch Plunger that does not align perfectly with the majority of Plungers indicated the presence of a misaligned Microswitch, requiring adjustment of the proper Microswitch Mounting Bracket (5).

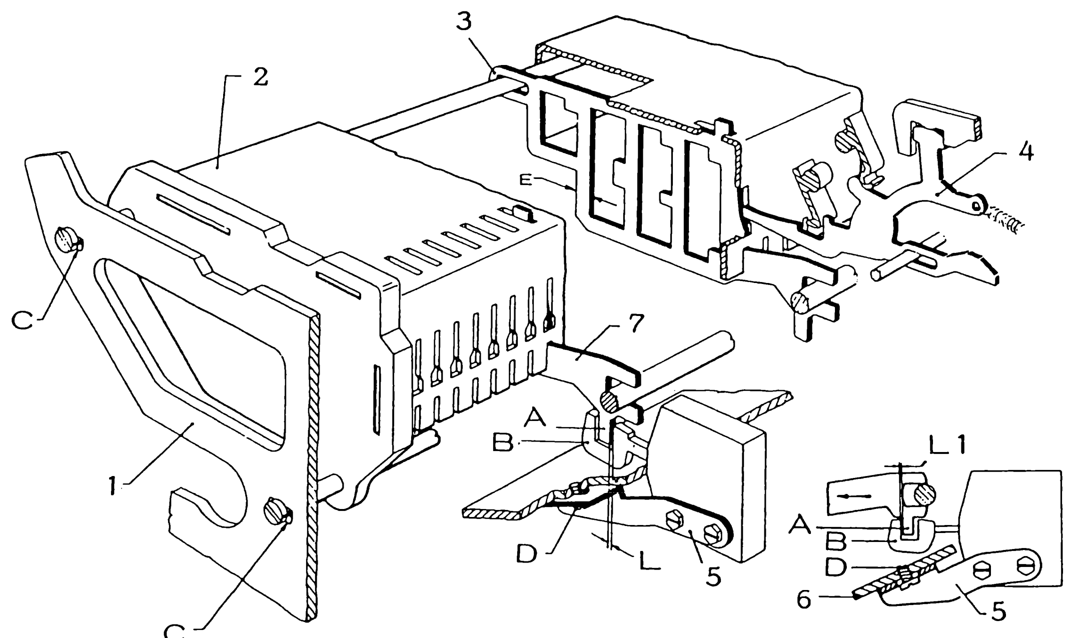


Figure 6

GENERAL RESET Fig. 7

The reset function consists of the following servo cycles:

- AG Cycle. Clears the computer of all information, and turns off the red light.

- AT Cycle. Synchronizes the computer functions and unlocks the keyboard. Establishment of timing turns on the green light.

The Reset Mechanism is comprised of the following:

- AG Microswitch
- AT Microswitch
- AG Combination Slide
- AT Combination Slide
- Reset Key
- AG Key Lever Latch

ASSEMBLY

AG Microswitch The AG Microswitch (12) provides the signal to clear all previous entries and instructions from the machine and turns off the red light.

AT Microswitch The AT Microswitch (10) provides the signal that times the computer functions and unlocks the keyboard.

AG Combination Slide The AG Combination Slide (1) positions the AG Microswitch plunger. The AG Combination Slide is unique in construction since its lugs are positioned to rotate all the coding bars in a way that will cause all the other Microswitch plungers to be pushed in.

AT Combination Slide The AT Combination Slide (2) positions the AT Microswitch plunger. Sets up numerical configuration that is not utilized.

Reset Key The Reset Key (5) is used to start the reset cycle. Key (6) has no extension on which to mount a key top and so is inaccessible to the operator. Key (6) is required to establish the rest position of Key Lever (7).

AG Key Lever Latch In addition to its normal functions, the AG Key Lever Latch (11) presets for the automatic starting of the AT cycle.

Link Creates conditions necessary for AT Cycle as AG Key Lever Latch is driven rearward.

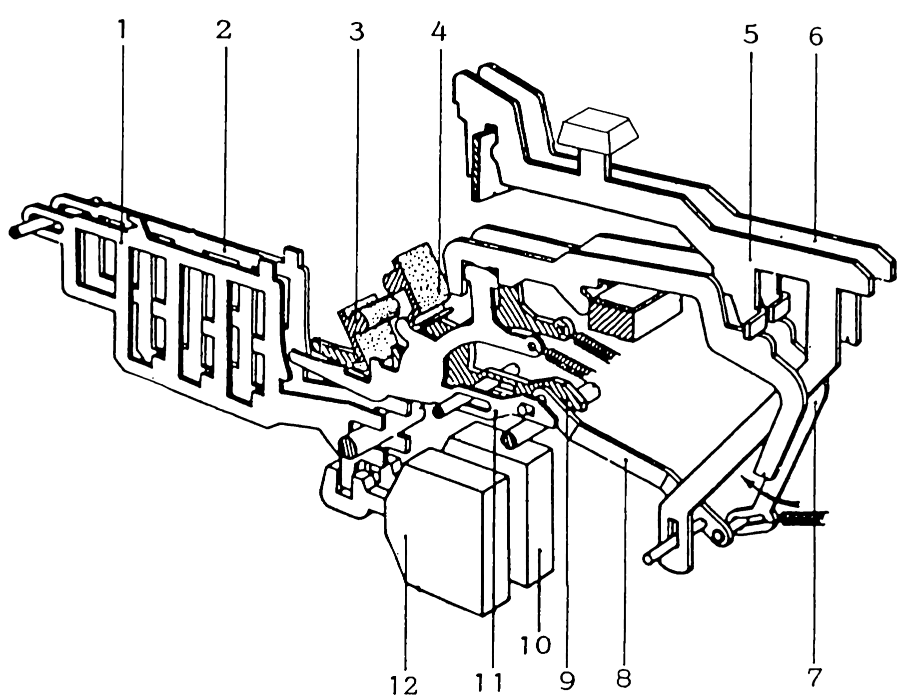


Figure 7

PARTS MOVEMENT Fig. 8

When the Reset Key (5) is depressed, the Entry cycle must be tripped twice (once manually and once automatically) to activate the source of mechanical power which results in the proper positioning of the AG and AT Microswitch plungers.

Since the sequence of parts movements is similar to a normal entry cycle, only those movements typical of general reset will be explained.

Depression of the Reset Key (5) allows rotation of the AG Key Lever Latch (11). The Key Lever Latch (11) engages the Rocking Bail (3) and causes a Servo Cycle (AG cycle) by rotation of the Starting Bail (4).
The servo cycle causes the Rocking Bail (3) to move the Key Lever Latch (11) rearward.

The rearward movement of the Key Lever Latch (11) will:

- Move the AG Combination Slide (1) rearward, pulling out the AG Microswitch plunger.

- Move the Connecting Link (8) rearward, rotating the Key Lever (7), in the direction of the arrow, releasing the Key Lever Latch (9).

Releasing the Key Lever Latch (9) presets for the tripping of the second servo cycle. The AT cycle will be held in memory until the Rocking Bail (3) already in motion returns to reset.

As the Rocking Bail returns to rest, it allows the Key Lever Latch (9) to start the second cycle of general reset (AT cycle).

The second servo cycle causes the Rocking Bail (3) to move the Key Lever Latch (9) rearward, causing:

- Restoration of the AG Combination Slide (1), pushing the AG Microswitch plunger in.

- The AT, AD, AC, AK and AA Microswitch plungers to be pulled out.

At the end of the AT cycle, the Servo Clutch disengages, preparing the machine for a new entry.

Note: The Microswitch plungers pulled out by the second cycle of general reset will remain in the out position until a new entry occurs for a different Microswitch pattern.

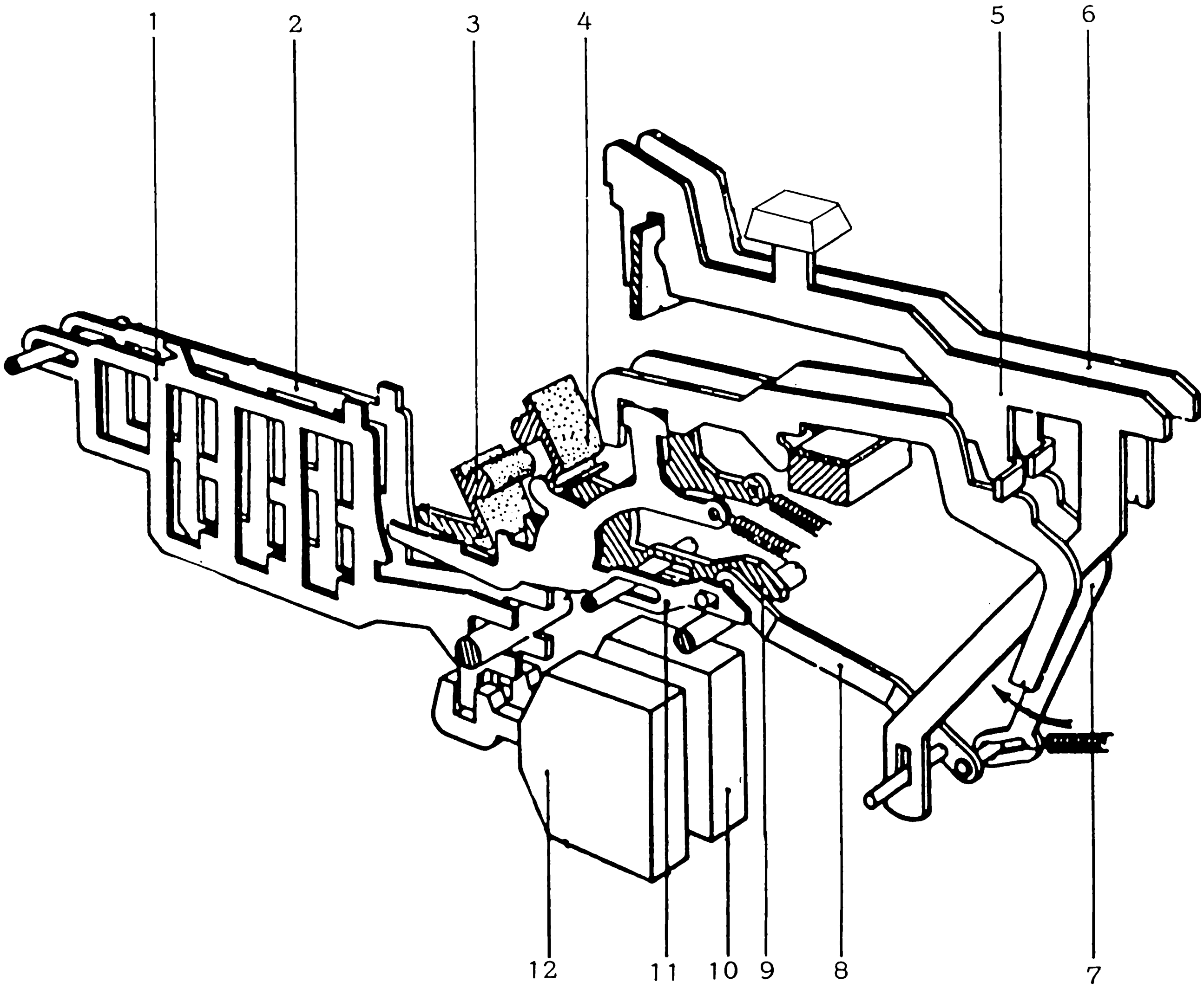


Figure 8

AK SIGNAL Fig. 9

Each keyboard entry results in setting microswitches to establish the binary code representing the data entered. Since this is a mechanical process, the time required for each microswitch to reach its proper position will vary slightly. The AK Microswitch operation establishes when the Electronic Computing Unit (ECU) should accept the binary coded data. The AK Microswitch operates only after all the other microswitches are set. This delayed operation serves to ensure that the correct information flows to the ECU. The following parts operate the AK Microswitch:

- AK Coding Bar
- AK Control Latch
- Cam
- AK Control Arm
- AK Control Bridge
- AK Microswitch Slide

ASSEMBLY

AK Coding Bar The AK Coding Bar (7) controls the release of the AK Control Latch (4). Only if a key depression results in the rotation of the AK Coding Bar will there be an AK signal.

> Note: No AK Signal is required for the Negative Sign, Decimal Point, and the first cycle of Reset.

AK Control Latch The AK Control Latch (4) either releases or holds the AK Control Bridge (3) inoperative during servo cycles.

Cam The Cam (1) permits the AK Microswitch plunger to be pulled in and out.

AK Control Arm The AK Control Arm (2) transfers the motion from the Cam (1) to the AK Control Bridge (3).

AK Control Bridge The AK Control Bridge (3) directly positions the AK Microswitch Slide (8) forward and rearward.

AK Microswitch Slide The AK Microswitch Slide (8) acts to pull the AK Microswitch plunger in and out.

PARTS MOVEMENTS Fig. 9

When a keyboard entry is made requiring an AK signal, the following sequence takes place once the servo cycle is tripped:

- The AK Coding Bar (7) rotates the AK Control Latch (4), moving wing B below step A of the AK Control Bridge (3).
- Under tension of the Spring (5) the AK Control Arm (2), connected to the AK Control Bridge (3), is now free to follow the profile of the Cam (1).

- Following the profile of Cam (1), the AK Control Arm (2) allows the AK Control Bridge (3) to position surface C above wing B of the AK Control Latch (4).

- The AK Microswitch Slide (8), yoked with AK Control Bridge (3), is moved rearward, pulling out the AK Microswitch plunger.

- Wing B then comes to rest against surface C.

As the Cam (1) continues to rotate, the raised portion of the Cam acts on the AK Control Arm (2), reversing the direction of the AK Control Bridge (3) and restoring the AK Microswitch Slide and plunger. As the AK Control Bridge (3) rotates to the rest position, the Spring (6) restores the AK Control Latch (4), engaging wing B with step A and rotating the AK Coding Bar (7) toward the rest position.

If a servo cycle that didn't require an AK Signal was now tripped, the AK Coding Bar (7) would not be rotated. When the Cam (1) rotates and the AK Control Arm (2) tries to follow, the AK Control Bridge (3) will be limited by the AK Control Latch (4). The Microswitch Slide and plunger will remain stationary.

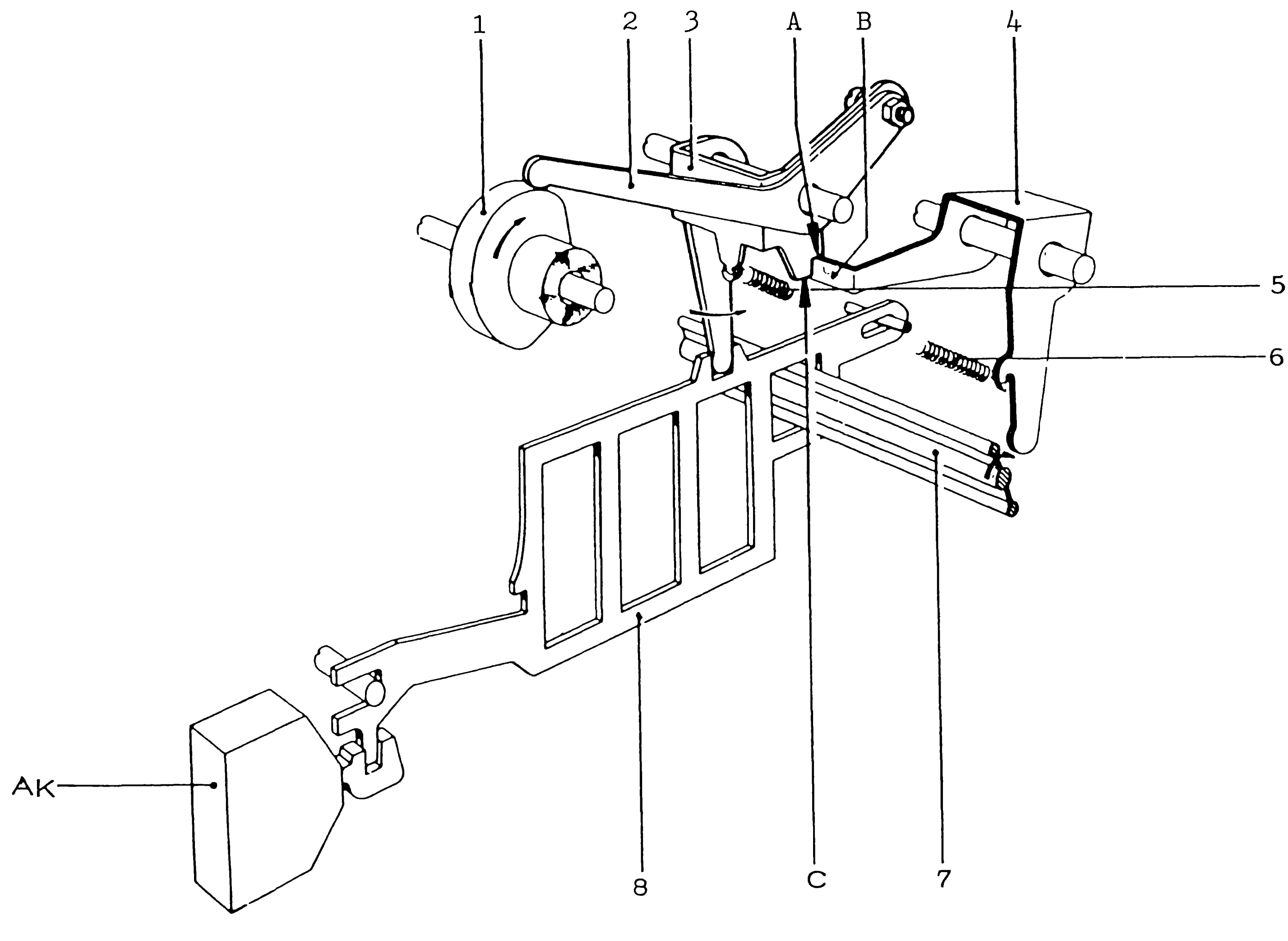


Figure 9

ADJUSTMENTS

AK Mechanism Adjustment Figure 10

Depress a key that requires an AK operation and rotate the servomechanism by hand while observing the motion of wing B. After the Entry Cam Group turns approximately one-third of a revolution, wing B must move downward to clear stop A of the AK Control Bridge (1) by distance C (figure 10A) so that the AK Control Bridge can move to the rear and produce an AK cycle. If wing B does not clear stop A, form wing B downward.

At the end of the servomechanism cycle, the wing B should spring upward to engage stop A. This action is shown about to take place in figure 10B. If it does not:

- Remove the Decimal Wheel Mounting Bracket and the Keyboard Lock Solenoid. Mark the position of the Solenoid before removing.

- Loosen the Nut (4) on the Eccentric Screw (3) (see figure 10B detail).

- With the Entry Cam Group in the rest position, turn the Eccentric Screw slowly clockwise until resistance is felt.

- With a Dutch double-end screwdriver, back off the screw very slightly and tighten the nut while holding the eccentric with the screwdriver.

- If the clearance C1 (as shown in figure 10B) cannot be attained, form the wing B.

AK Microswitch Adjustment

Should there be indications that the AK Mechanism is operating more than once for each entry or not operating at all, perform the following check:

Raise the keyboard, depress the zero (0) key, and manually rotate the large Servo Pulley while observing the action of the AK Microswitch (5) (figure 10B) through the right side of the keyboard. The AK slide finger (D) must not touch the nylon plunger (E) after the slide has moved its maximum distance to the rear.

Similarly, after the AK slide has returned forward to its rest position, the clearance C1 (shown in figure 10B) must be obtained. Note that the nylon plunger (E) must now be resting against the Microswitch body. The slide finger (D) should make NO contact with the plunger in either the rest or activated position.

Should inspection reveal a misadjusted AK Microswitch (5), proceed as follows:

- Loosen the Microswitch Mounting Bracket (6) and position it so that a minimum clearance (F) exists between the AK slide finger (D) and the nylon plunger (E).

- Depress the zero (0) key and rotate the large Servo Pulley by hand until the AK slide finger (D), as seen through the right side of the keyboard, has moved its maximum distance to the rear. Again check for the minimum amount of clearance, but this time on the other side of the AK slide finger (D). Remember that in either position of the AK slide finger must stand free of the nylon plunger (E).

- Tighten the mounting screw and cycle the servo as before to check the adjustment.

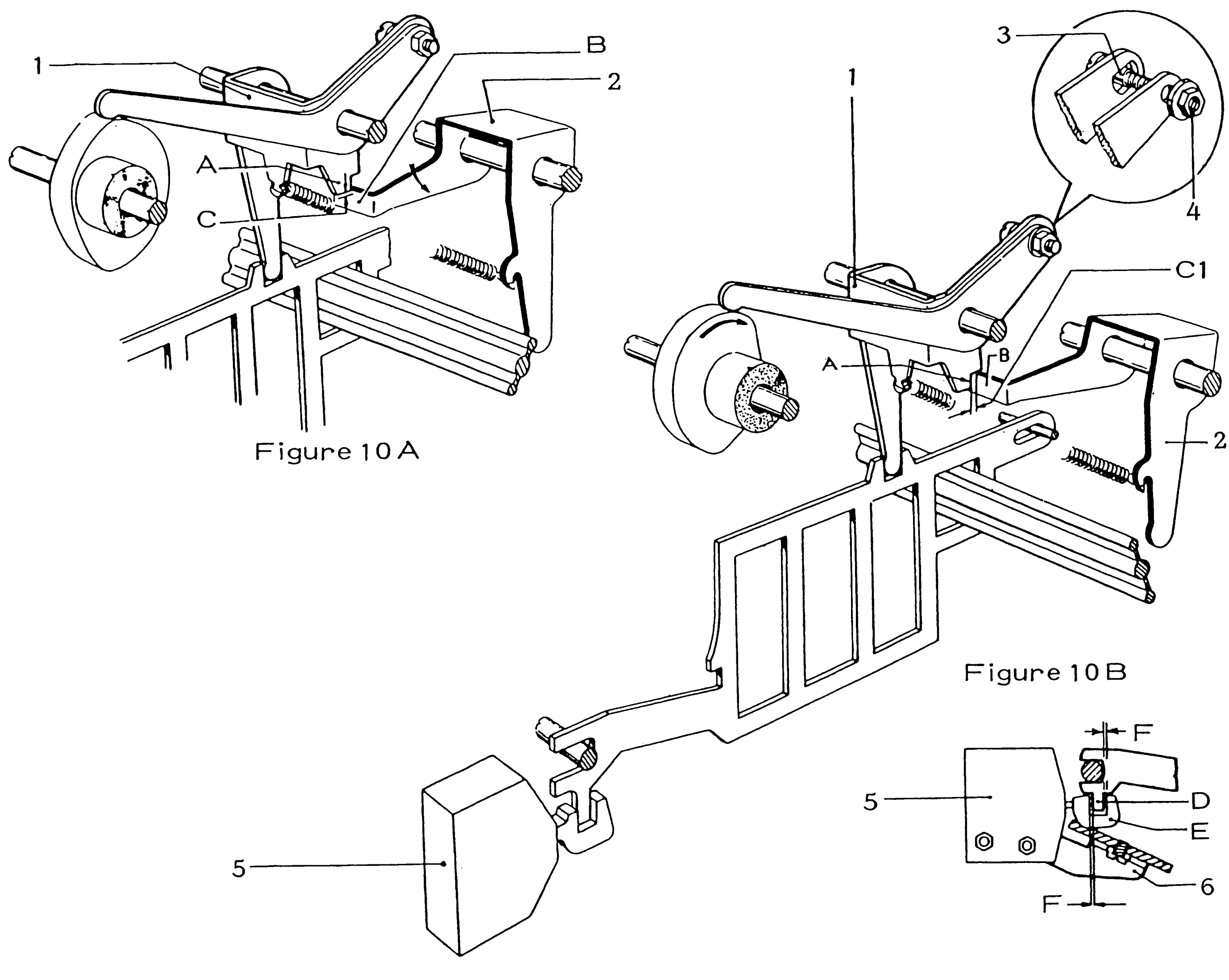


Figure 10

KEYBOARD ENTRY MECHANISM Fig. 11

The function of the Keyboard Entry Mechanism is to activate the Coding Bar Slide corresponding to the keyboard key which has been depressed.

The required mechanical power is supplied by the Servomechanism which produces a cycle every time a keyboard key is depressed.

The Keyboard Entry Mechanism is comprised of:

- Key Stems
- Key Levers
- Key Lever Latches
- Start Bail
- Rocking Bail

ASSEMBLY

The Key Stem (4) is directly connected to the Key Top (5), which is depressed by the operator when entering inputs. The function of the Key Lever (6) is to hold or release the Key Lever Latch (10). The Key Lever (6), under tension of a Spring (7), rests against the wing (B) of the Key Stem and against the Guide Bar (8). The function of the Key Lever Latch (10) is to rotate the Start Bail (3), initiating, through linkage, a servomechanism cycle. The rest position of the Start Bail is adjustable.

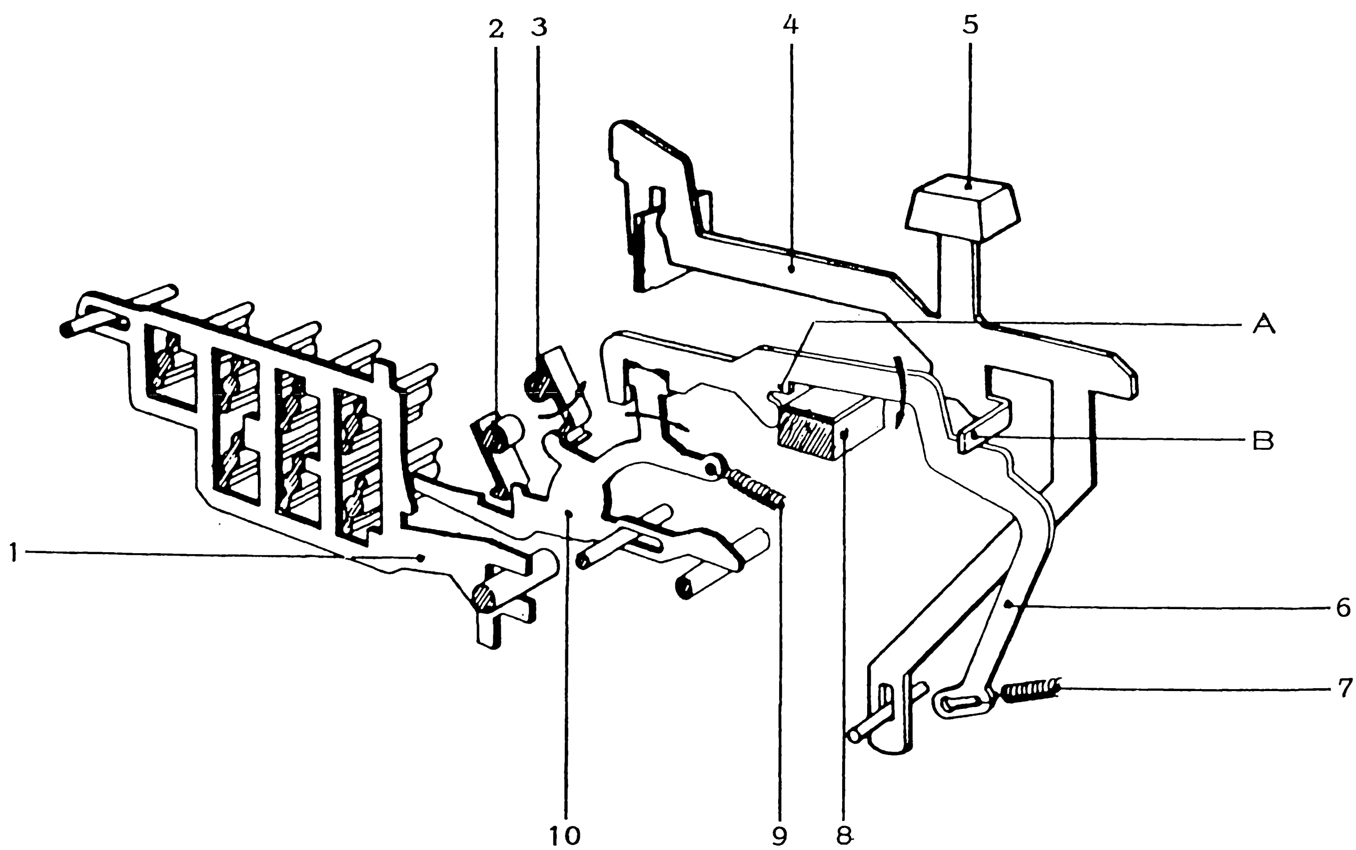


Figure 11

PARTS MOVEMENT

The depression of a key (figure 12A) will:

- Cause the wing (C) to rotate the Key Lever (4) in the direction of the arrow, pivoting on the Guide Bar (6).

- Free the Key Lever Latch (3) to rotate under tension of the Spring (7).

- Position the cutout (A) of the Key Lever Latch (3) in the path of the Rocking Bail (1), and the extension (B) will rotate the Start Bail (2).

Rotation of the Start Bail will initiate a servomechanism cycle. The first 180 degrees of the cycle causes the Rocking Bail (1) to rotate rearward. The rearwatd movement of the Rocking Bail (figure 12B) will:

- Move the Coding Bar Slide (1) rearward.

- Relatch the extension (A) with the cutout in the Key Lever (3).

- Move the Key Lever (3) slightly rearward, locating pivot step B above and to the rear of the Guide Bar (5).

During the second 180 degrees of the servomechanism cycle, the Rocking Bail (1) (figure 12C) rotates toward the front of the machine, clearing the cutout of the Key Lever Latch (6), allowing Springs (3 and 5) to pull the Key Lever (2) and Key Lever Latch forward, until the Key Lever limits on the Guide Bar (4).
With extension A pivoting in the cutout of the Key Lever (2), the Spring (5) causes the Key Lever Latch (6) to rotate down and away from the Rocking Bail (1) which is returning to the rest position (figure 12A).

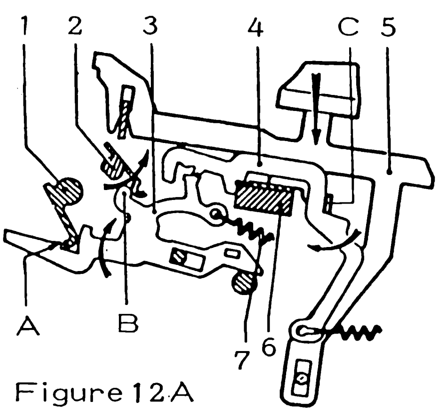


Figure 12A

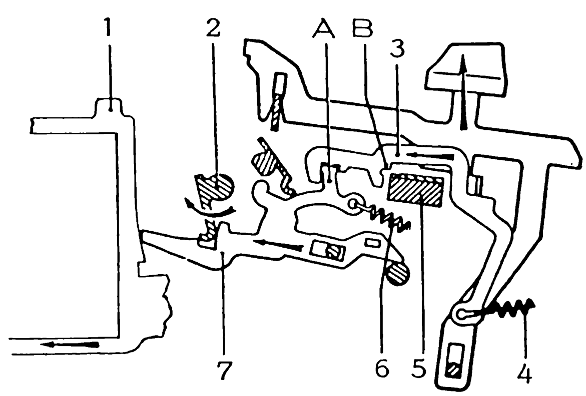


Figure 12B

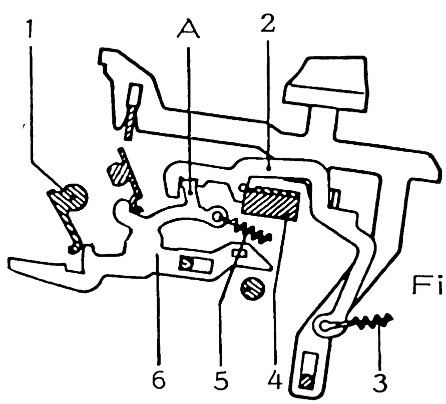


Figure 12C

Figure 12

The Servomechanism does not give repeat cycles when a key is held depressed throughout the servomechanism cycle. With the key held depressed, the following differences can be noted:

- When the Key Lever (1) moves rearward (figure 13A), the Pivot Step (A) drops behind the Guide Bar (2).

- As the Key Lever (2) moves forward (figure 13B), the Pivot Step (A) limits against the Guide Bar (3) and the Key Lever Latch (1) is brought to rest, completing the servomechanism cycle.

For another servomechanism cycle to be tripped, the key must be released, allowing the Spring (4) to:

- Raise the Pivot Step (A) above the Guide Bar (3).

- Pull the Key Lever (2) forward so that the surface (B) limits against the Guide Bar (3).

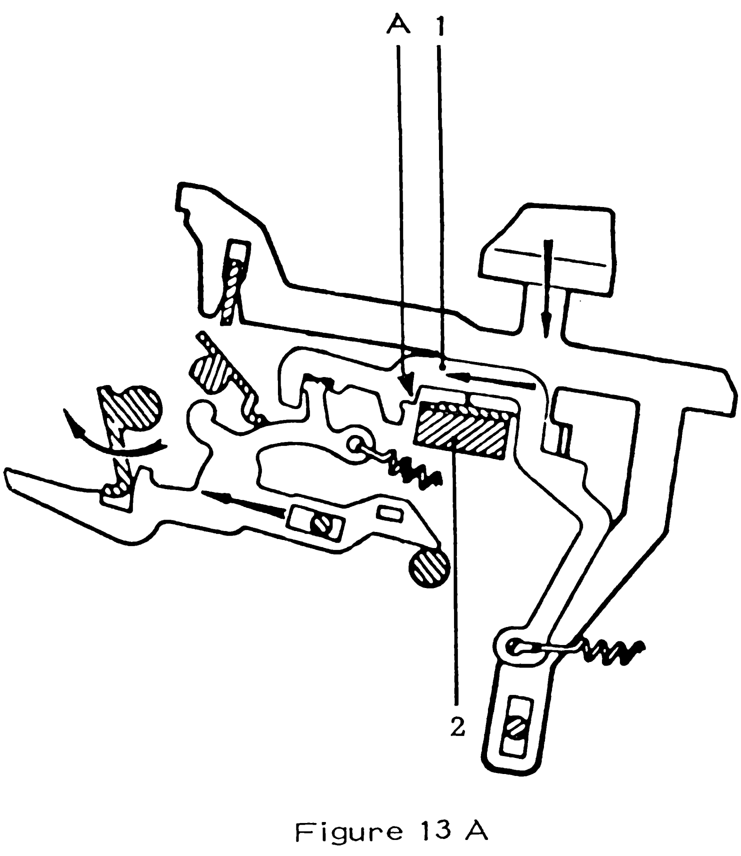


Figure 13 A

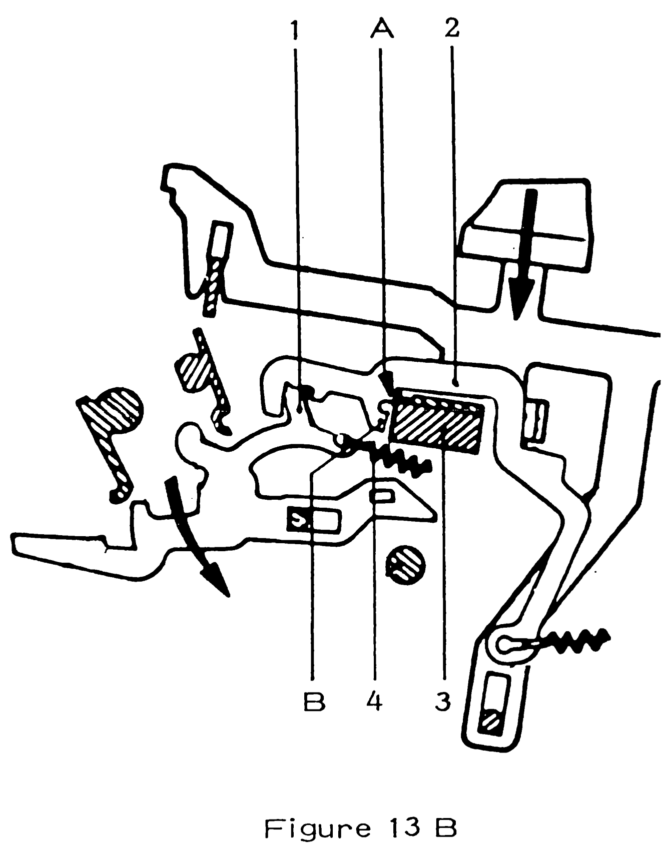


Figure 13 B

Figure 13

KEYBOARD MEMORY Figure 14

If two or more keys are depressed simultaneously, the machine will not accept any of the entries and the Double-Entry Lock Mechanism will be tripped (see Servomechanism). However, two or more keys depressed in rapid succession will be accepted by the machine because of the Keyboard Memory feature. Once the Rocking Bail (1) (figure 14) has started to rotate, any key depressed during the remainder of that servomechanism cycle will be held in memory. In figure 14, Rocking Bail (1) rotates, pulling Key Lever Latch (2) (broken line) to the rear. During this movement a key has been depressed, releasing another Key Lever Latch (2A) (solid line), which results in the following:

- The Key Lever Latch (2A) comes to rest against the Rocking Bail (1) which is rotating. Therefore, the upward travel of the Key Lever Latch is cut short.

- With a Key Lever Latch held in memory, the servo cycle still takes place as usual.

- At the end of the servo cycle, the return of the Rocking Bail (1) allows the Key Lever Latch held in memory to complete its upward rotation, thus starting another servo cycle.

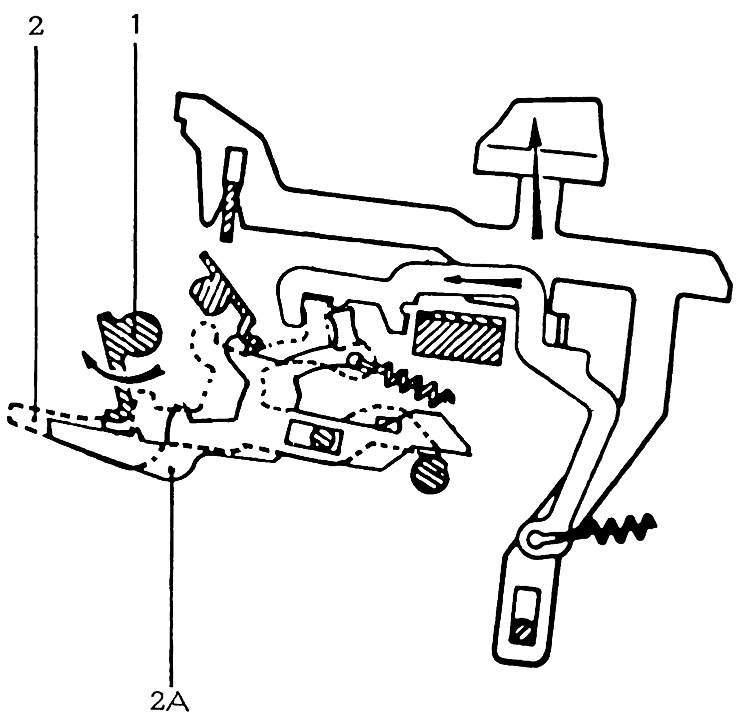


Figure 14

COMPUTING KEYBOARD LOCK

The function of the Keyboard Lock is to prevent keyboard entry from taking place when:

- The P101 is initially turned on and the Reset key has not been depressed.

- Computations are being carried out in the Electronic Computing Unit (ECU).

- The equipment is printing.

The Keyboard Lock is comprised of the following basic functional parts:

- Keyboard Lock Solenoid
- Actuating Bridge
- Cam
- Locking Comb
- Locking Comb Detent

ASSEMBLY Figure 15

The Keyboard Lock Solenoid The Keyboard Lock Solenoid (2) is energized or deenergized as determined by the ECU. When the Keyboard Lock Solenoid is energized, it controls the position of Actuating Bridge (10). When the Keyboard Lock Solenoid is deenergized it allows the Spring (3) to control the position of the Actuating Bridge.

Actuating Bridge The Actuating Bridge (10) positions the Locking Comb (8) to lock or unlock the keyboard.

Cam The Cam (4) is the source of power for moving Locking Comb (8) between the locked and unlocked positions. It is part of the Servomechanism.

Locking Comb The Locking Comb (8) prevents key depression (excluding the Reset Key) when the machine is first turned on, when the machine is computing or when the machine is in the process of printing.

PARTS MOVEMENTS

When data entry must be prevented, the ECU deenergizes the Keyboard Lock Solenoid (2), and the following take place:

- The Spring (3) moves the Actuating Bridge (10) and Plunger (1) toward the left until the Actuating Bridge limits on the Keeper (11). This movement of the Actuating Bridge moves arm B to a position out of the path of the Cam (4) and positions arm A in the path of the Cam (4).

- The Cam (4), which is rotating in the direction of the arrow, moves the Actuating Bridge 10 rearward.

- The Actuating Bridge, through the Link (5) and Crank (6), positions the Locking Comb (8) below the understep (C) of the Key Lever (7). Fig. 15

- The Locking Comb Detent (9) maintains the Locking Comb and associated linkage in the locked position, preventing keyboard entry from taking place.

To permit data entry, the ECU energized the Keyboard Lock Solenoid, initiating a sequence of part movements exactly the reverse of those described above. The Keyboard will be unlocked as a result.

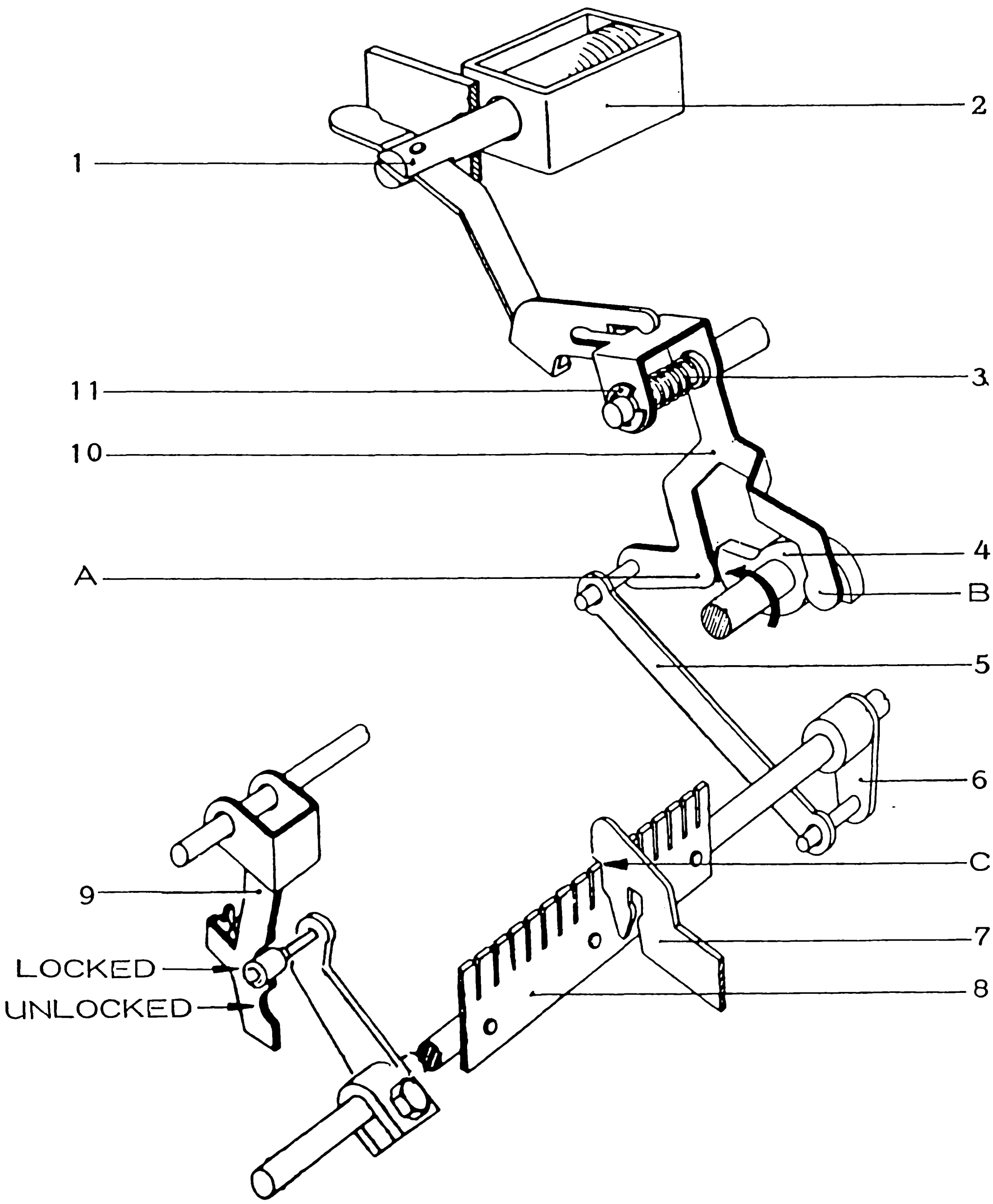


Figure 15

Turn on the machine, depress the Reset Key, and observe that the Plunger (2) is pulled in and the arm (B) of the Actuating Bridge (5) centers over the prefile of the Cam (6). The Locking Comb (9) must be open, that is, with the Crank (10) having its roller in the lower notch (unlocked) of the Locking Comb Detent (11).

Turn off the machine. Observe that the Plunger (2) has moved to the left and that arm (D) of the Actuating Bridge now faces the Cam surface. It is important that the Actuating Bridge does not touch the Cam in either state, but has a small clearance (C) as shown. Arms (B) and (D) only engage the Cam surface momentarily during changes of position of the Computing Lock.

If the above conditions are not present, perform the following adjustments, as required:

Keyboard Lock Solenoid: Loosen the Keyboard Lock Solenoid mounting Screws (4). Squeeze the Plunger (2) and the Keyboard Lock Solenoid (3) together so that the Plunger bottoms. Move this assembly to the right until the Actuating Bridge (5) is against its right hand stop, and extension A touches the Frame (1). Tighten the Screws (4) while holding the assembly in this position.

> CAUTION: To obtain the most reliable Keyboard Lock Solenoid operation, the plunger must be free of any bind. Do not apply oil to the plunger or solenoid under any circumstances as this will cause hydraulic locks to occur and prevent maximum plunger movement.

Actuating Bridge: Form the rear extension of the Actuating Bridge (5) to bring arm (D) into alignment with the lobes of the Cam (6). Depress the Plunger (2) completely, and form arm (B) into alignment with the Cam face.

Locking Comb: Turn power off and then on again. DO NOT reset. Loosen setscrew on the Crank (10). Tighten the setscrew again when the following conditions have been obtained.

- -The detent roller is in the upper notch (locked) of the Locking Comb Detent (11)
- -The teeth (F) of the Locking Comb (9) are under extensions (E) of Keys (8)
- -A small clearance (C) exists between arms (B) and (D) of Bridge (5) and the Cam (6).

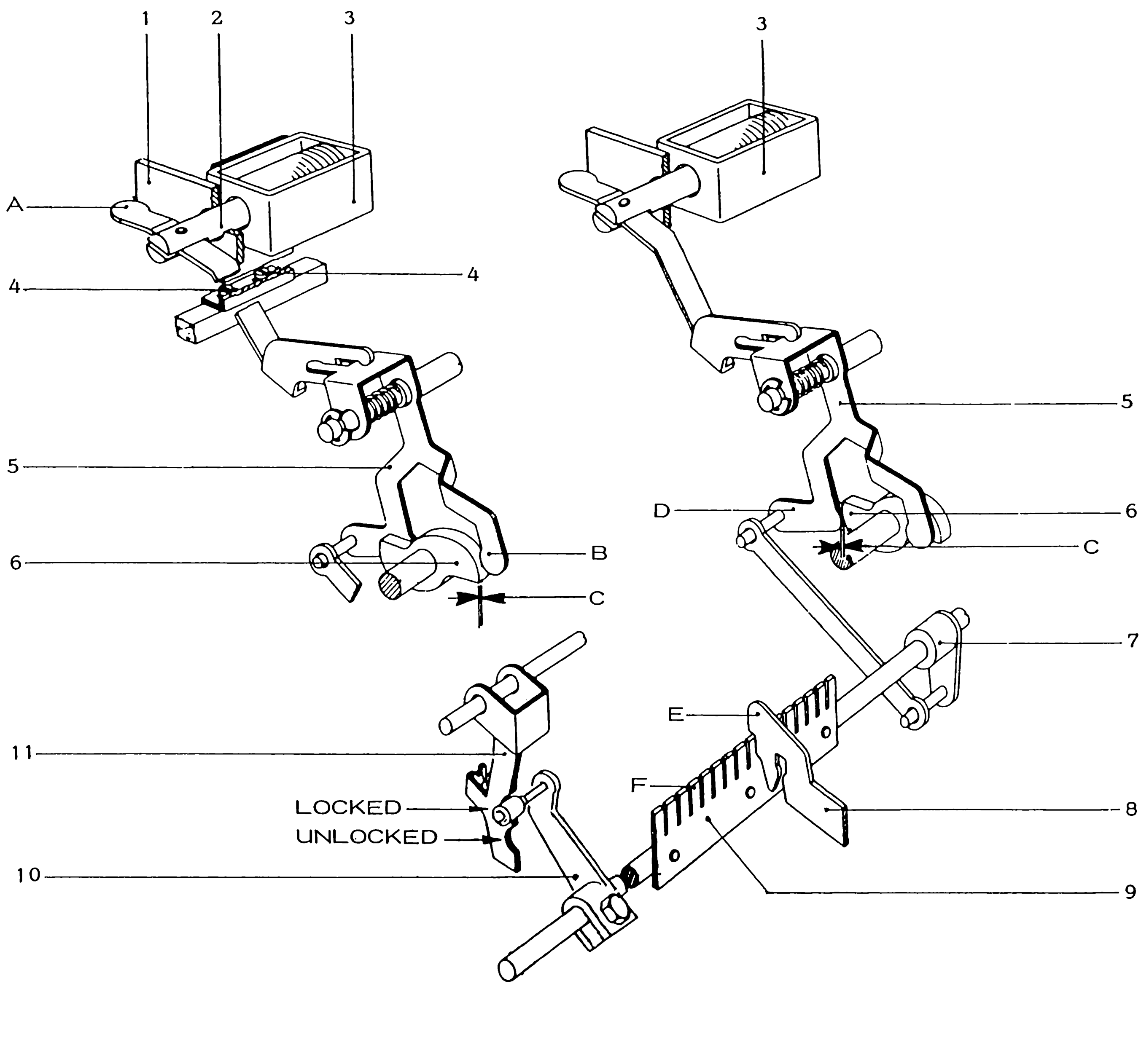


Figure 16

SECTION 3
SERVOMECHANISM

INTRODUCTION TO THE SERVOMECHANISM

The Servomechanism is composed of two sections: The Entry Servomechanism and the Double-Entry Servomechanism. The function of the Entry Servomechanism is to supply power for the mechanical movements required to change keyboard entries to binary-coded decimals. The function of the Double-Entry Servomechanism is to supply power to operate the double-entry lock which prevents an entry from being made if two or more keys are depressed simultaneously.

ENTRY SERVOMECHANISM

The Entry Servomechanism is comprised of:

- -Servo Shaft
- -Entry Cam Group (Five Camming Surfaces)
- -Entry Servo Clutch Assembly

ASSEMBLY Refer to Figure 17

Servo Shaft The Servo Shaft (6) rotates constantly while the machine is turned on. It supplies power for the mechanical operation of the Entry Servomechanism and the Double-Entry Servomechanism.

Entry Cam Group The functions of the five cams making up this group are as follows:

-The Cam (1) oscillates the Rocking Fork which controls the movement of the Rocking Bail

-The Cam (2) positions the Stop Bridge for disengagement of the Entry Servo Clutch

-The Cam (3) returns the Control Latch to its locking position.

-The Cam (4) controls the in-out movement of the AK Microswitch plunger when certain preset conditions are met.

-The Cam (5), in conjunction with the Locking Arm, prevents the rotation of the Entry Servomechanism Cam Group in the reverse direction.

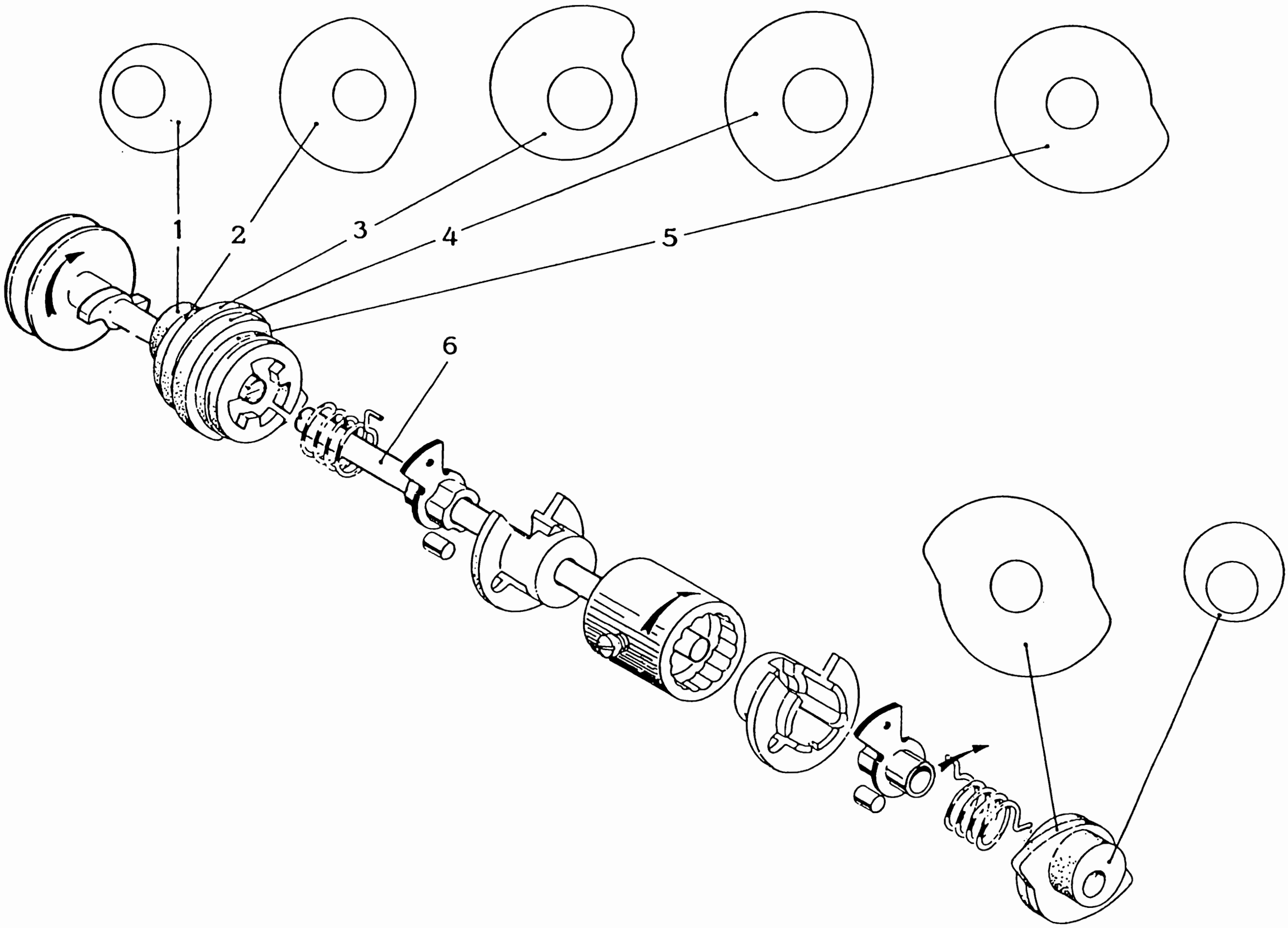


Figure 17

Entry Servo Clutch Assembly Fig. 18

When the Entry Clutch is engaged, it causes the Entry Cam Group to rotate with the Servo Shaft. When the Clutch is disengaged, the Servo Shaft rotates independently of the Entry Cam Group and the following conditions exist:

-Clutch Flange (2) (see figure 18A) rests against the extension (A) under the power of the Spring (1).

-Rollers (5) rest in dwells (B) of the Clutch Flange (2), away from the scalloped surfa (D) of Drive Housing (3). (See figure 18B).

When a key is depressed:

-The Extension (A) is rotated upward in the direction of the arrow (see figure A).

-The Clutch Flange (2) is rotated clockwise by a Spring (1).

-Rotation of the Clutch Flange (2) forces the Rollers (5) outward through slots (C) of the Roller Guide (4) and against the scalloped surface (D) of the Drive Housing (3). The Drive Housing and the Roller Guide are thus locked together (see figure 18C).

-The Drive Housing (3) rotates the Roller Guide (4) which is keyed in to the Entry Cam Group. The clutch is engaged, and the Entry Cam Group rotates.

> Note: The clockwise rotation of the Clutch Flange (2) is limited when the rollers (5) contact the scalloped surface (D) of the Drive Housing (3).

Toward the end of the 360° rotation of the servo cycle, the Clutch Flange (2) will contact the extension (A) which has been repositioned in its path. At the same time, the Roller Guide (4) rotates further to complete the 360° of the cycle. This will result in:

-Disengaging the clutch by positioning rollers (5) in dwells (B) of the Clutch Flange (2).

-Allowing the Locking Arm to assume its locking position, preventing any counterrotation of the Entry Cam Group.

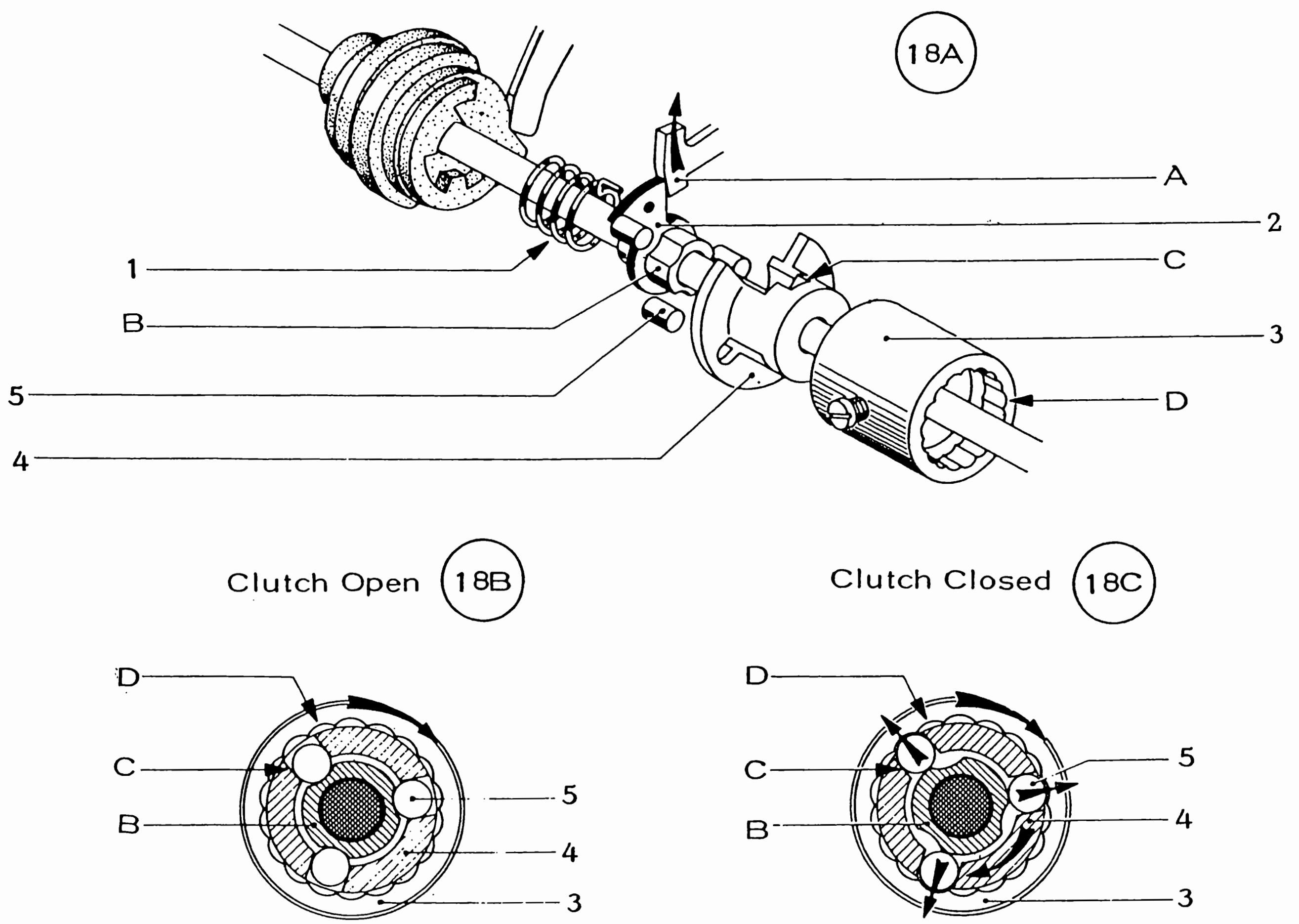

18A
A
2
1
C
B
3
5
D
4
Clutch Open
18B
D
C
5
B
4
3
Clutch Closed
18C
D
5
C
4
B
3

Figure 18

PARTS MOVEMENT - Refer to Figure 19

The Clockwise rotation of the Start Bail (7) causes the Link (8) to rotate the Bridge (6) in the direction of the arrow.

The Bridge (6), fixed to the Spindle (1), causes the Control Latch (3) which is also fixed to the Spindle, to rotate in the direction of the arrow, releasing its hold on extension (A) of the Stop Bridge (5).

The Stop Bridge, under tension of Springs (2) and (4), moves the extension (A) above the Clutch Flange (9). The clutch engages, locking the Entry Servo Cam Group to the rotating Servo Shaft.

As the cam group rotates, the following sequence of movements will result in the disengagement of the Entry Servo Clutch:

-During the first part of the cycle, the Control Bridge (3) is held rotated by the tension of Spring (4) against Cam (10).

-The Cam (11) then rotates, lowering the extension (A) of the Stop Bridge (5) into the path of the Clutch Flange (9).

-While the Cam (11) is holding the Stop Bridge rotated, the diminishing profile of the Cam (10) allows the Control Bridge (3), under spring tension, to be positioned above the extension (A) of the Stop Bridge.

-The Cam (11) relaxes its hold on the Stop Bridge (5), permitting the Spring (4) to rotate it upward until it limits on the Control Bridge (3) which has been positioned above it.

-The Clutch Flange (9) now contacts the extension (A), disengaging the Entry Servo Clutch.

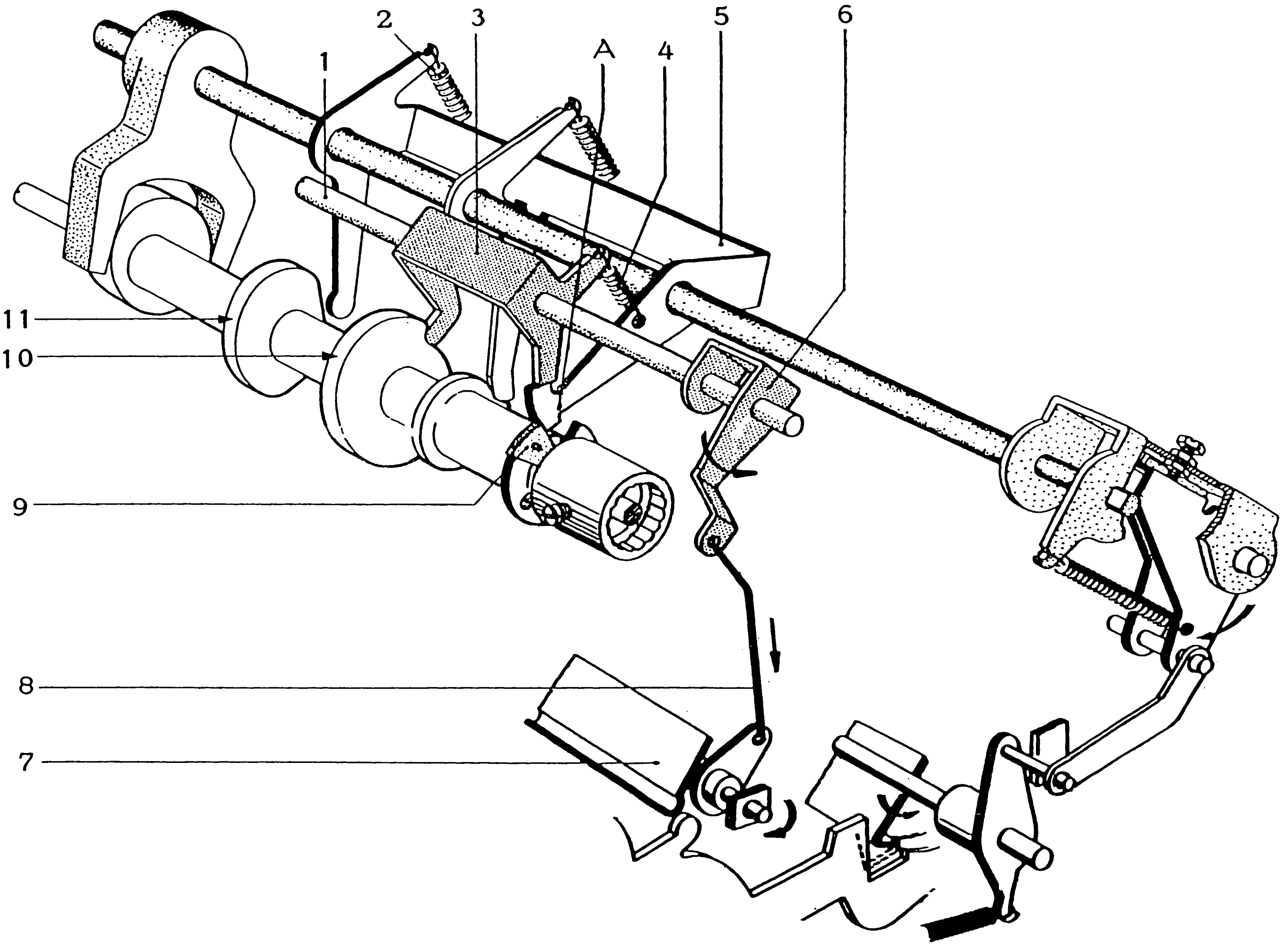


Figure 19

ENTRY CYCLE

The Entry Cycle supplies the mechanical force necessary to position Encoder parts for converting keyboard entries to binary-coded decimal digits. The following parts are related to the entry cycle:

-Cam
-Rocking Fork
-Flexible Joint
-Rocking Bail

Assembly Figure 20

The Cam (1) of the Entry Cam group is the source of power for the entry cycle.

The Rocking Fork (2), under control of the Cam (1), oscillates the Shaft (3) and Flexible Joint (4 and 5).

The Flexible Joint will transfer motion to the Rocking Bail (8) through the Link (6) and Crank (7). The Rocking Bail will move any Key Lever Latch, tripped as the result of a single key depression, rearward (see figure detail).

Parts Movement

A key depression will engage the Entry Servo Clutch Assembly, initiating an entry cycle.

During the first 180 degrees of the cycle, Cam (1) rotates Rocking Fork (2) to the front, causing the Shaft (3) and Flexible Joint (4 and 5) to rotate in the direction of the arrow.

The Flexible Joint, through the Link (6) and Crank (7), rotates the Rocking Bail (8) in the direction of the arrow.

During the second 180 degrees of the entry cycle, the parts movements will be the reverse of those described above.

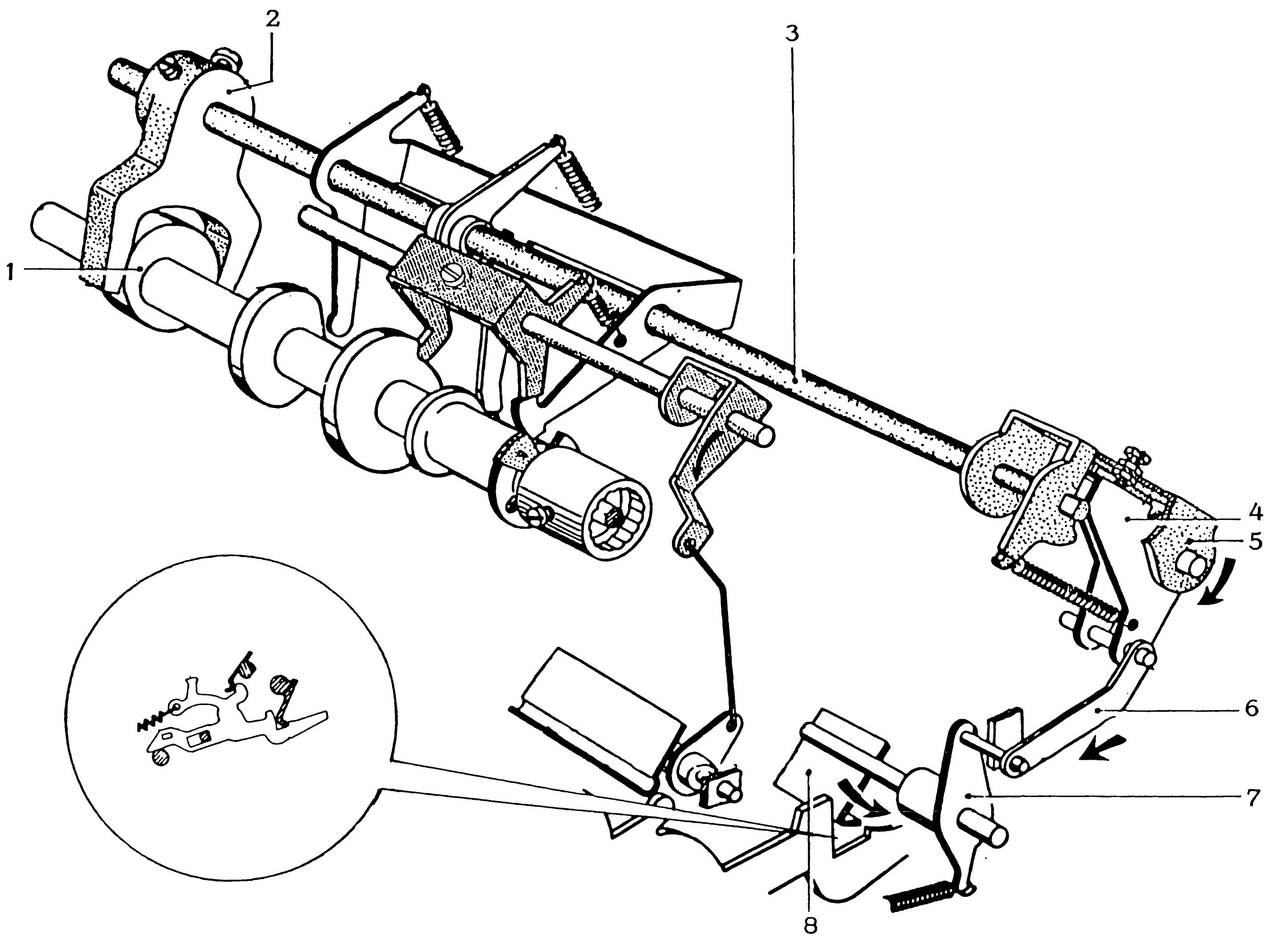


Figure 20

ADJUSTMENTS

The Encoder and Microswitch settings are powered through rotation of the Entry Cam Group. The rotation of the Eccentric Cam (1) is converted to a reciprocating motion by the Rocking Fork (2). If the Rocking Fork or any other part in the subsequent chain of parts becomes misadjusted, improper or no activation of the Encoder and Microswitch may result.

> Note: The Entry Servo Release adjustment can be performed separately. The Flexible Joint, Rocking Fork and Rocking Bail adjustments are interdependent and must be performed in the order given.

Entry Servo Release Adjustment Figure 21

Turn power on and depress any key. The Servomechanism should cycle once for each key depression, except for the Reset key which will give two servo cycles.

Should any depressed key fail to produce a servo cycle, cause repeat servo cycles, or work intermittently, adjust the Entry Servo Release Mechanism as follows:

- With the Servomechanism exposed, depress the key which has operated improperly and observe the reaction of the Control Bridge (4), Stop Bridge (3) and Clutch Flange (19).
- If the Control and Stop Bridges do not release the Clutch Flange, adjust the Crank (17) so that the Starting Bail (16) does not come to rest against key lever latches but positions itself over them with a minimum clearance.
- Turn power off and depress any key. Adjust the Control Bridge (4) so that the Stop Bridge (3) frees the Clutch Flange (19) to rotate, as showi in lower detail. Tighten the Adjustment Screw (5). Check operation to assure that the Control Bridge provides secure blocking action for the Stop Bridge (3) when the mechanism is at rest.

Flexible Joint Adjustment

All adjustments should begin with the Flexible Joint (9) and (10), since the amount of travel imparted to the Coding Bar Slides is affected by the rest position of the stud (A) in relation to the frame opening at B.

The adjustment of the screw (8) on the Flexible Joint (10) and the position of the Rocking Fork (2) on the Shaft (7) affect the position of the stud (A), which must not be permitted to touch the frame (B) at either extreme of its movement.

Initial Adjustment

- With the large Pulley Wheel removed from the Servomechanism, measure the distance between the Shaft (7) and the Stud (11) on the Flexible Joint (9) to which the Link (12) is clipped. This dimension must be 30mm (1-3/16") between centers, as shown in figure 21. Adjust the Screw (8), if required. Mount the Pulley Wheel as far on the end of the Servo Shaft (18) as possible.

Final Adjustment

- Check that the frame (B) does not prevent free movement of the stud (A), by making an entry and rotating the Pulley. If there is evidence that restriction occurs due to the stud (A) striking the frame (B), then adjustment of the Rocking Fork (2) is required.

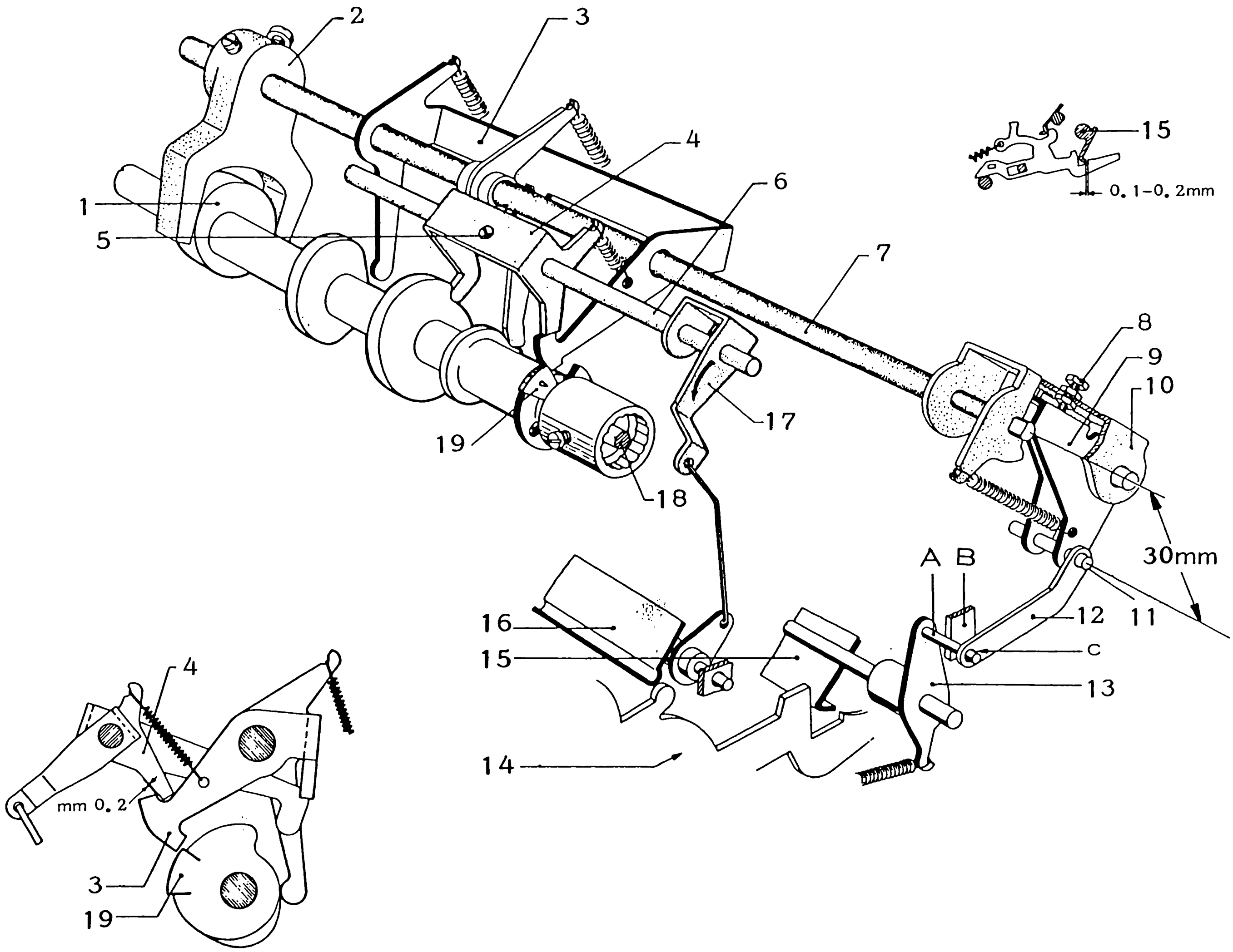


Figure 21

FA 7-1935
Moreen

Rocking Fork Adjustment Figure 22

-Loosen both screws on the Rocking Fork (2). By hand, trip the Stop Bridge (3) clear of the Clutch Flange (19). Rotate the Servomechanism by hand until the forked end of the Rocking Fork is in its most forward position when viewed from above.

-Rotate the Flexible Joint (9 & 10) so that the Link (12) pushes the stud (A) forward as far as possible. Hold the linkage in this position and tighten the most accessible screw on top of the Rocking Fork.
Complete the cycle by rotating the servo further; then tighten the remaining screw on the Rocking Fork.

-Check operation with the power on.

Rocking Bail Adjustment

If the Flexible Joint (9, 10) and the Rocking Fork (2) are or have been correctly adjusted, the position of the Rocking Bail (15) can be checked.

-While looking through the small rectangular opening in the left side of the Keyboard Frame, depress the Reset key with the power off. The nearest Key Lever Latch must rise and engage the lip of the Rocking Bail (15) easily, but with a minimum clearance as shown in figure (22). Now look through an identical opening on the right side of the Keyboard while depressing the Print Key. Observe that the nearest Key Lever Latch (14) performs with an action and clearance identical to that of the first Key Lever Latch.

-If the above observations are not obtained, loosen the screws on the Rocking Bail Crank (13) and adjust the Rocking Bail.

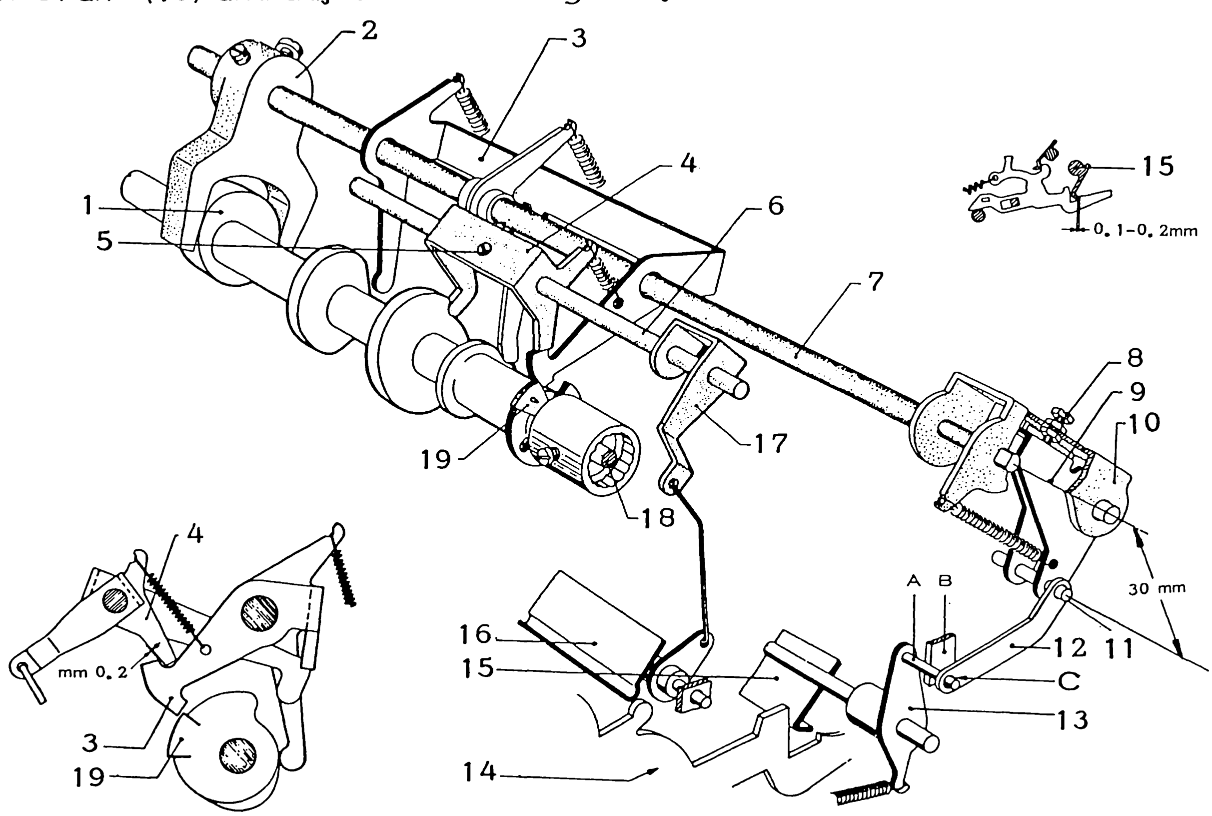


Figure 22

DOUBLE ENTRY SERVOMECHANISM Figure 23

When two keys are depressed so that two Key Lever Latches engage the Rocking Bail simultaneously, the Rocking Bail will not be able to push both Key Lever Latches rearward. The Actuating Lugs located on the Coding Bar Slides attempt to rotate at least one Coding Bar in both a clockwise and counterclockwise direction at the same time. The opposition encountered blocks the travel of the Rocking Bail, causing the Double Entry Keyboard Lock to actuate. This resets the tripped Key Lever Latches, and signals the operator that a double entry condition exists. These functions are performed during the first 180 degrees of the double entry cycle. At the end of this portion of the cycle, the clutch disengages. The Double Entry Servomechanism must then be manually tripped by pushing the "keyboard" release button to restore the Double Entry Lock to rest.

The Double Entry Servomechanism is comprised of:

-Servo Shaft
-Double Entry Cam Group (two cams)
-Double Entry Servo Clutch Assembly

ASSEMBLY

Servo Shaft - The Servo Shaft (4) is constantly turning when the machine is turned on. It supplies the power for the mechanical operation of the Double Entry Servomechanism.

Double Entry Cam Group - The functions of the two cams making up this group are as follows:

-The Cam (2) positions the Keyboard Locking Arm for the resetting of all the Key Lever Latches and for signaling the operator that a double entry condition exists through an increase in Key Spring Pressure.

-The Cam (1) prevents the counterrotation of the Double Entry Cam Group.

Double Entry Servo Clutch Assembly - When the Double Entry Servo Clutch Assembly (3) is engaged, it causes the Double Entry Cam Group to rotate with the Servo Shaft (4). When the clutch assembly is disengaged, it allows the Servo Shaft to rotate independently of the Double Entry Cam Group.

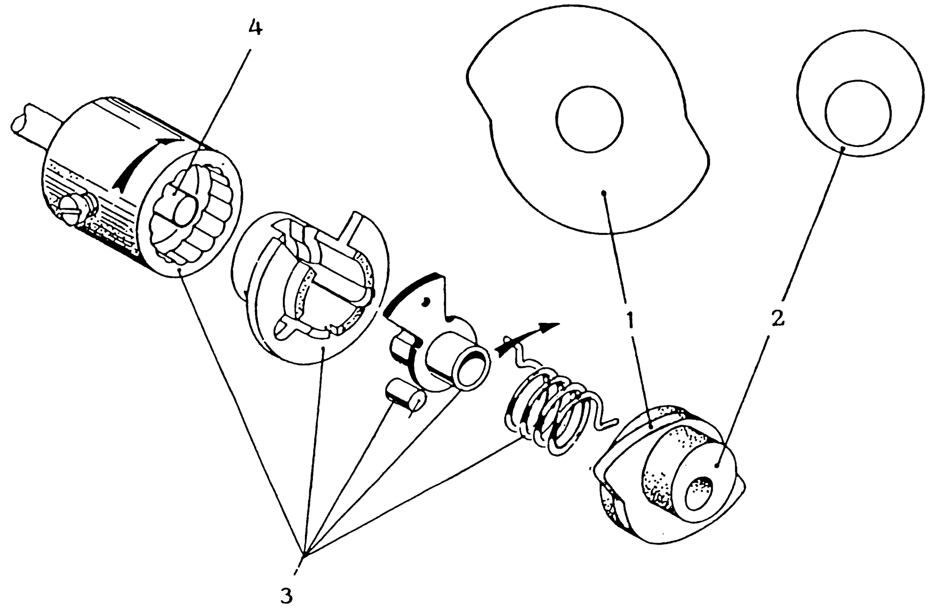


Figure 23

When the clutch is disengaged, the following conditions exist (figure 24A):

-The Clutch Flange (3) rests against the extension (B) under the power of Spring (7) (Figure 24B).

-The Rollers (6) rest in dwells (D) of the Clutch Flange (3), away from the scalloped surface (C) of the Drive Housing (4) (figures 24A and 24B).

Upon the simultaneous depression of two or more keys:

-The extension (B) rotates in the direction of the arrow (figure 24A).
-The Clutch Flange (3) is rotated clockwise by Spring (7).
-The Clutch Flange rotation forces the Rollers (6) outward through slots (E) of Roller Guide (5) and against the scalloped surface of the Drive Housing (4). The Drive Housing and Roller Guide are thus unified (figure 24C).

-The Drive Housing (4) rotates the Roller Guide (5) which is keyed to the Double Entry Cam Group (8). The clutch is engaged, and the Double Entry Cam Group rotates.

> Note: Clockwise rotation of the Clutch Flange (3) is ended when the Roller (6) comes in contact with the Drive Housing (4).

Towards the end of the first 180 degree rotation of the Double Entry Servo Cycle, the Clutch Flange (3) will contact the extension (A) which has been positioned in its path. The Roller Guide (5) will rotate further, to complete the 180 degrees of the cycle. This results in:

-Disengagement of the clutch by positioning the Rollers (6) in the dwells (D) of the Clutch Flange (3).

-The Locking Arm (1) assuming a position that will prevent any counterrotation of the Double Entry Cam Group.

When the operator resets the Keyboard Release Key, the extension (A) raises, allowing the Clutch Flange (3) to rotate and engage the clutch for the second 180 degree rotation. Resetting the Keyboard Release Key also causes the extension (B) of the Lower Stop Bridge (2) to be raised into the path of the Clutch Flange (3). As the second 180 degree rotation of the clutch is completed, the clutch disengages, and the Double Entry Servo-mechanism is brought to rest.

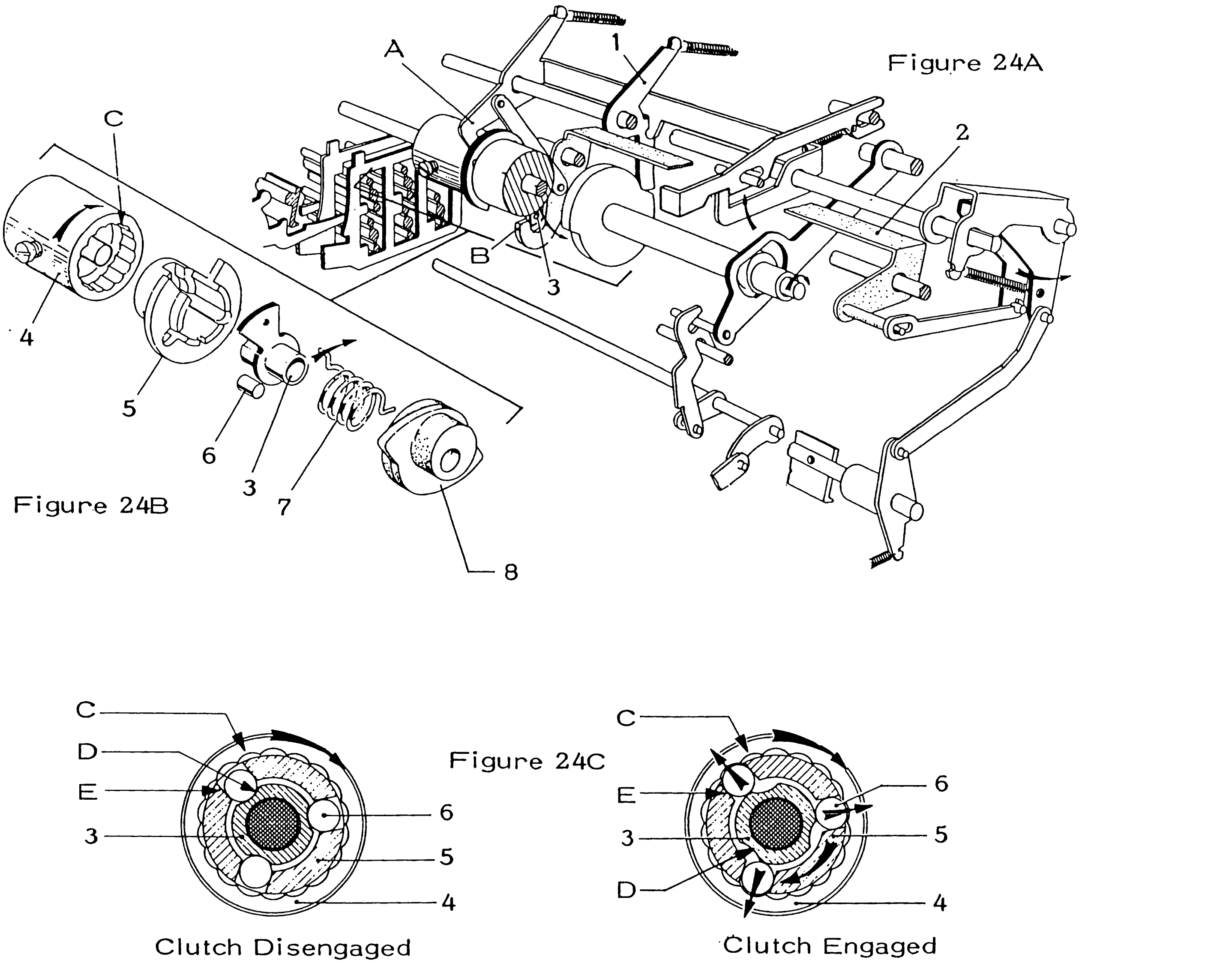


Figure 24A
A
1
2
B
3
C
4
5
6
3
7
8
Figure 24B
C
D
E
3
6
5
4
Clutch Disengaged
Figure 24C
C
E
6
3
5
D
4
Clutch Engaged

Figure 24

PARTS MOVEMENT

When two or more keys are depressed simultaneously, a servomechanism cycle will be tripped as in a single entry. However, in a multiple entry condition, two or more Key Lever Latches engage the Rocking Bail. The Rocking Fork, controlled by the Entry Cam Group, attempts to rotate the Rocking Bail by means of a Flexible Joint. The Flexible Joint is unable to rotate the Rocking Bail due to the opposition encountered when attempting to move two or more Key Lever Latches rearward. The Flexible Joint (4) yields and is forced to rotate down and away from the Flexible Joint (3), causing the following (see figure 25A):

-The Link (5) rotates the Lower Stop Bridge (6), in the direction of the arrow, removing the extension (C) from the path of the Clutch Flange (7) and engaging the clutch.

-The extension (A) of the Upper Stop Bridge (1) is positioned into the path of the Clutch Flange (7).

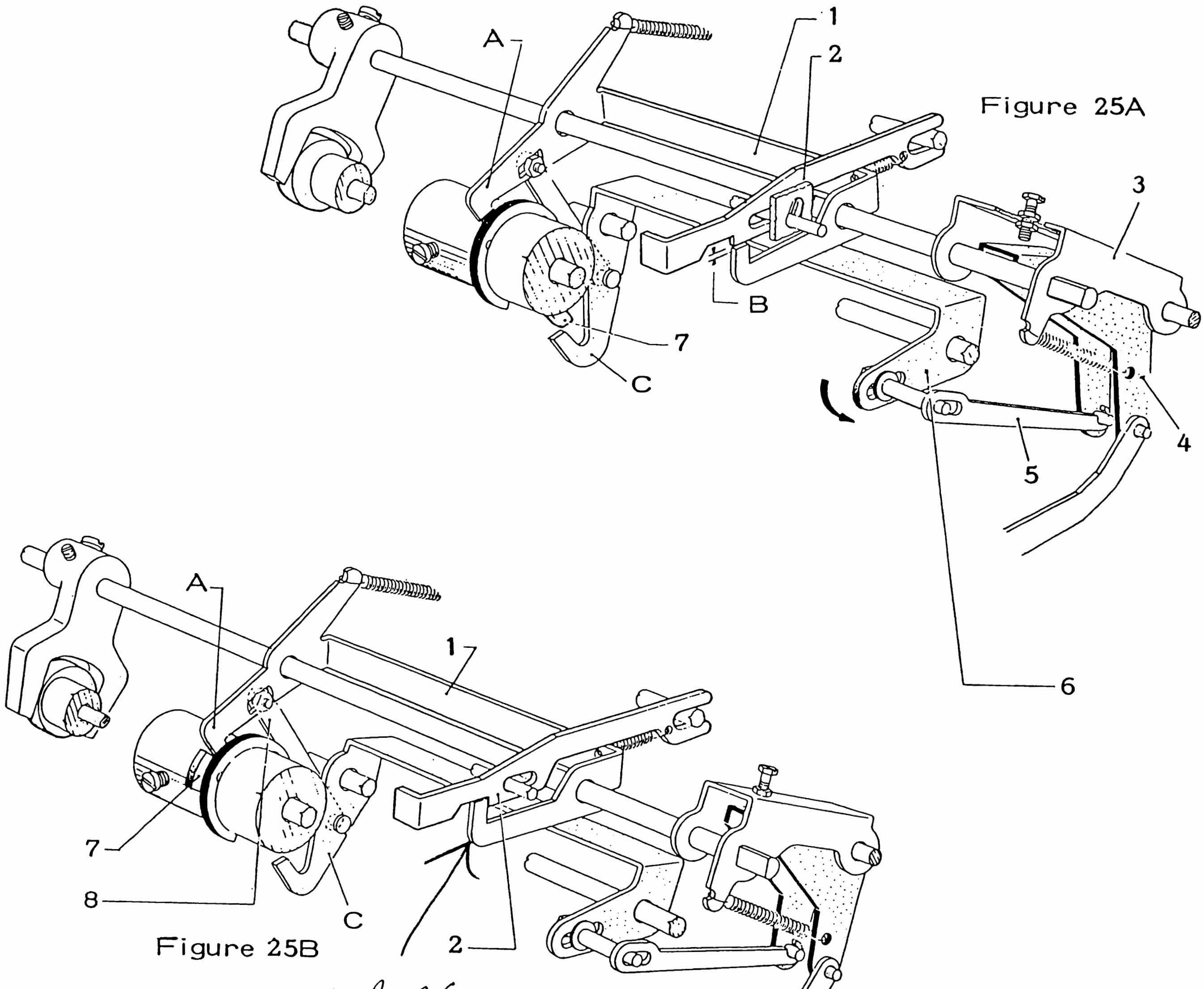
-The Keyboard Release Key Lever (2) is released to come forward under spring tension, and the lever surface then holds the Upper Stop Bridge (1) rotated.

At approximately 180 degrees of the servomechanism cycle, the Clutch Flange (7) will contact the extension (A) (see figure 25B), disengaging the clutch. The machine is then in the double entry lock condition. To restore the machine to normal operating condition, the Keyboard Release Key Lever (2) must be manually reset. As the Keyboard Release Key Lever (2) is pushed to the rear, the Upper Stop Bridge (1), through a spring action, causes the following:

-The extension (A) releases the Clutch Flange (7).

-The Link (8) rotates the Lower Stop Bridge (6), raising the extension (C) into the path of Clutch Flange (7). (See figure 25B)

-The Clutch Flange (7) contacts the extension (C), disengaging the clutch at the end of the second 180 degree rotation (see figure 25A).



WRONG
Should be down

Figure 25

When the functions of the first 180 degrees of the Double-Entry Cycle are completed, the clutch is disengaged. When a key is now depressed, the operator will notice a resistance as the surface (A) of the Key Lever (1) causes the spring of the Lock Control Bridge (10) to yield. Though the key can be fully depressed, no servo cycle results since the Bar (9) prevents the Key Lever Latches from rotating.

To reset the mechanism for normal keyboard operation, the Keyboard Release Key Lever must be manually positioned rearward. The resetting of the Keyboard Release Key Lever trips the second 180-degree rotation of the Double-Entry Cycle. The Cam (3) raises the Keyboard Locking Lever (2), reversing the direction of the parts movements listed above.

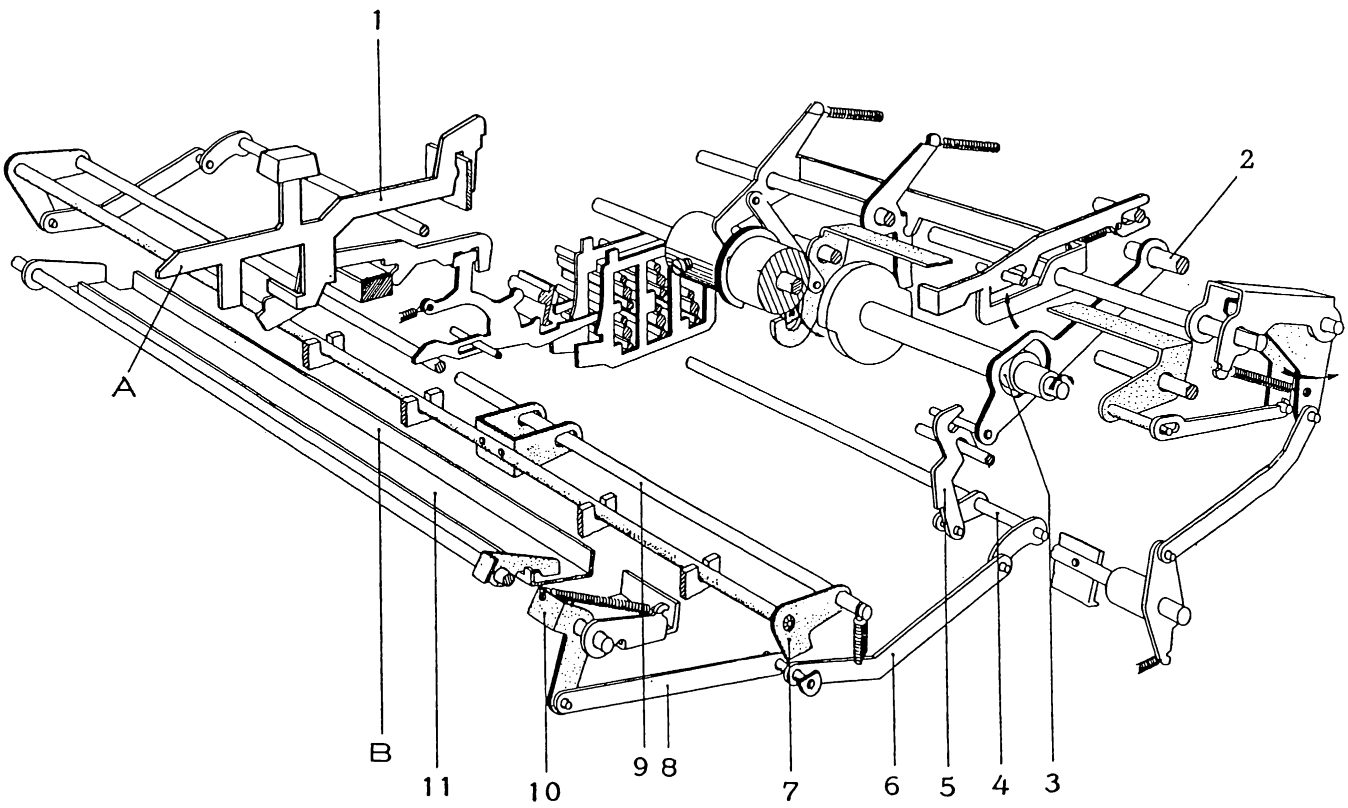


Figure 26

DOUBLE-ENTRY CYCLE

The Double-Entry Cycle supplies the mechanical power necessary to restore the Key Lever Latches and to signal the operator that an error has been made by tripping the Double-Entry Lock. The following are the basic functional parts related to the Double-Entry Cycle.

-Cam
-Keyboard Locking Lever
-Reset Bridge
-Keyboard Locking Bail

Assembly. Figure 26

The Cam (3) is the source of power for the Double-Entry Cycle.

The Keyboard Locking Lever (2) is activated by the Cam (3) and transfers the power for the movement of the Reset Bridge (7) and Keyboard Locking Bail (11).

The Reset Bridge (7) will restore all the tripped Key Lever Latches.

The Keyboard Locking Bail (11) positions under the surface (A) of the Key Lever (1) and offers a noticeable resistance to normal key depression; this enables the operator to sense by touch that an error has been made.

Parts Movement: Figure 26

When two or more keys are depressed simultaneously, normal operation of the Flexible Joint is prevented. The Flexible Joint yields, tripping the first 180 degrees of the double-entry cycle and causing the following to occur:

-The Cam (3) rotates, lowering the Keyboard Locking Lever (2).

-The downward movement of the Keyboard Locking Lever will:

-Lower the Link (5).
-Rotate the Bridge (4) counterclockwise.
-Move the Links (6 and 8) rearward.

-Rearward movement of the Link (6) rotates Reset Bridge (7), causing Bar (9) to restore all tripped Key Lever Latches.

-Rearward movement of the Link (8) rotates Lock Control Bridge (10) counterclockwise.

-The spring of the Lock Control Bridge causes the Keyboard Locking Bail (11) to follow its clockwise rotation, positioning the lip (B) just below the forward extension (surface A) of Key Lever (1).

ADJUSTMENTS

Lower Stop Bridge and Keyboard Release Key Lever

Refer to figure 27A. With power turned off, simultaneously depress any two keys. Rotate the Servo manually while observing the extension (A) on the Lower Stop Bridge (3). Extension (A) must release the Clutch Flange (5) before its downward limit of travel is reached, and the Keyboard Release Key Lever (2) must spring forward at the same time. If this action does not occur properly, proceed as follows:

-Adjust clearance C by removing the pulley and adjusting the position of Screw (4) in the slot (B) until both actions can be reliably obtained.

Note: If clearance C is too great, release of the Clutch Flange for the second 180° rotation of the Double Entry Cam Group may be impaired.

-After clearance C has been set, check that the Keyboard Release Key Lever operates normally. Should it either fail to release, or release when only one key is depressed, adjust clearance C1 (figure 27A) by moving the spindle (1) up or down so that the Release Key lever (2) springs out reliably whenever the Double Entry Servo section is operated to lock the keyboard.

Keyboard Release Refer to figure 27B. With the keyboard locked, adjust the Link (3) in relation to the slot (A) on the Upper Stop Bridge (1) so that the amount of clearance (C) is sufficient to release the Clutch Flange (4) when the Keyboard Release Key Lever (2) is reset.

Clutch Flange Release Refer to figure 27B. Depress the Keyboard Release Key Lever (2) while observing extension B of the Upper Stop Bridge (1). Sufficient clearance (C) should be available so that the Clutch Flange (4) is released.

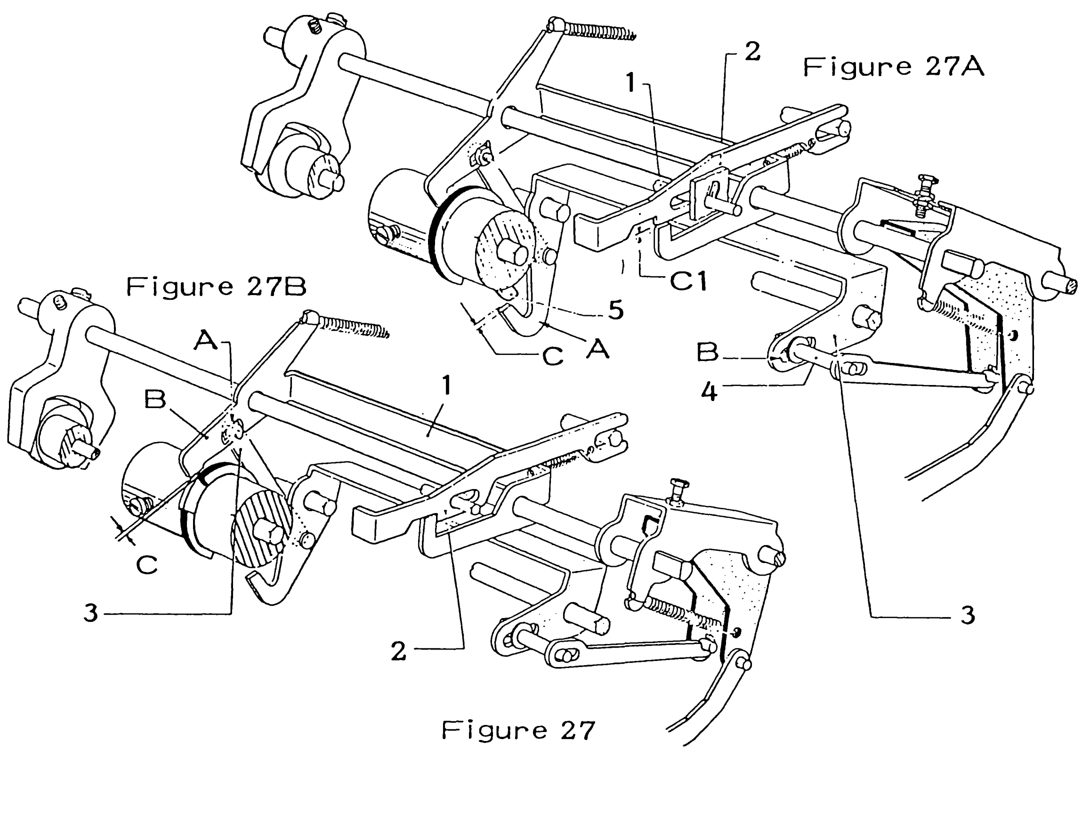


Figure 27

Keyboard Lock Refer to figure 28. Depress two keys simultaneously, and manually rotate the servo through a complete cycle. Look through the right side of the Keyboard and watch for movement of Key Lever Latches (1) as you depress keys at random. If a Key Lever Latch should raise into engagement with the rocking bail, loosen the Actuating Arm Eccentric (2) and reposition it to minimize Key Lever Latch rotation.

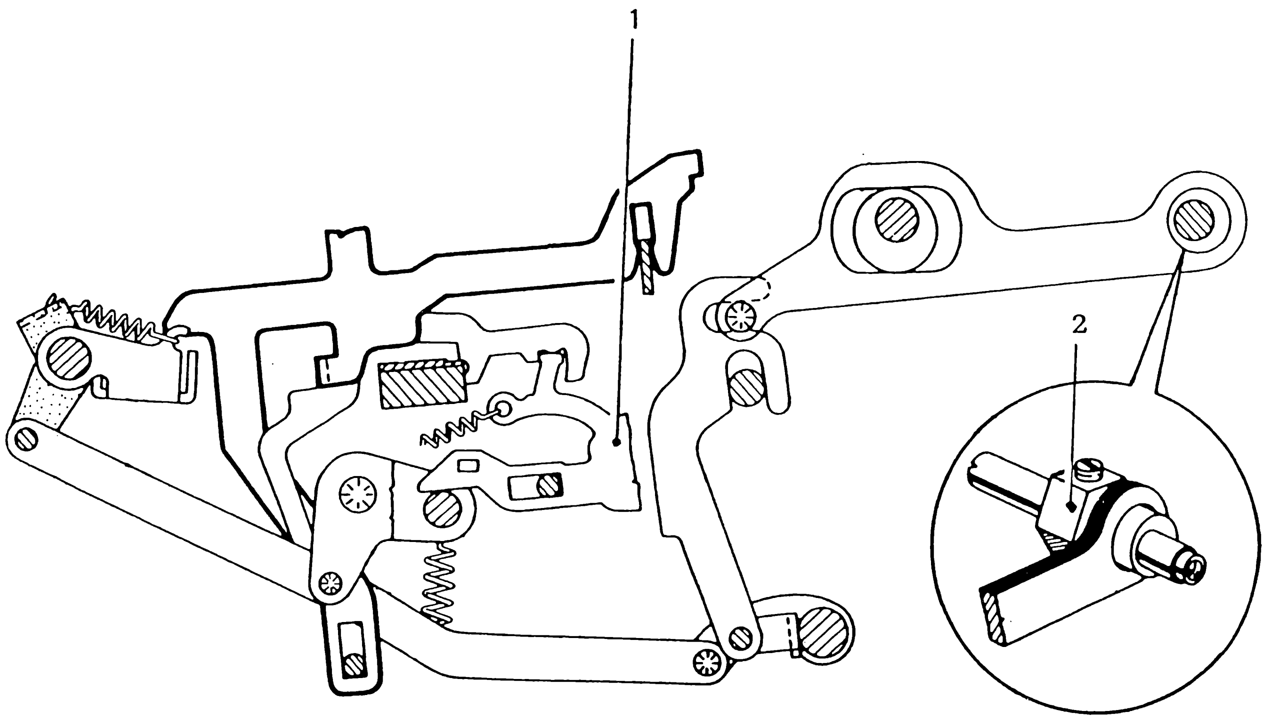


Figure 28

SECTION 4
PRINTER UNIT

INTRODUCTION TO PRINTER SECTION

ELECTRONIC PRINTER SECTION THEORY

The printing function of the P101 is the mechanical result of an operation that is electrically initiated, electrically controlled, and electrically terminated.

Electrical Initiation

The ECU (Electronic Computing Unit) must be synchronized with the Printer Assembly to accomplish the following:

- Bring the numbers and symbols on the character drum into a correct relationship with the binary-coded electrical impulses contained in the ECU.

- Provide a way to sense when the hammer should be fired to print the desired number and symbol.

When a print operation is required, the ECU sends a "prepare-to-print" signal (CAR) to energize the Print Control Solenoid. This results in:

- Engagement of the print carriage for travel to the left.
- Presetting paper feed and ribbon feed
- Positioning the AW microswitch plunger in (signal AW1 at level1).

When Switch AW is at level 1, the electrical impulses generated by the printer determine when the ECU should send the "fire-hammer" signal (SPM).

Electrical Control

When using the four microswitches (AA, AB, AC, and AD) which correspond to the first four columns of the binary number system, 15 is the largest decimal number that may be represented. Binary coded information that is to be printed is treated according to its relationship with the quantity 15. Each decimal digit and operational symbol has an established binary code associated with it. This being the case, the difference between the binary-coded decimal value assigned to each individual number and symbol and the decimal value 15 will remain constant.

The ECU knows that whenever the difference between any coded information and 15 has been counted, and is equal to the desired character, the hammer should be signaled to fire. The mechanisms that enable the ECU to count this difference are the Strobe Wheel and Pickup Coil. When the AW microswitch is at level 1, the pulses generated by the lugs of the Strobe Wheel as they pass the Pickup coil are received and counted by the ECU. Each lug of the Strobe generates a 1- count pulse (OK Pulse) as it passes the Pickup Coil.

Since the Strobe Wheel is fixed on the Character Drum Shaft, the numbers and symbols on the drum are in direct relationship with the binary-coded decimal data contained in the ECU. Once counting begins, the amount the drum rotates to position the correct number or symbol under the hammer corresponds to a certain number of strobe pulses. (Compensation is made for the lag that results from the mechanics of firing the hammer).

Electrical Termination

When the most significant digit has been printed, the ECU sends the "finish-print" signal which deenergizes the Print Solenoid. When the Print Solenoid deenergizes, the mechanical action that resulted from the CAR signal is reversed. The AW micro-switch plunger is then in the out position; AW 2 now carries current indicating to the ECU that the printing phase is complete.

PRINTER SECTION

The Printer Section of the P101 performs the following functions:

-Converts binary code data to decimal data.

-Indicates what entry has been keyed into the computer by immediately printing out the entry data.

-Prints out computational results.

-Controls the movements of the paper tape and the printing ribbon.

The Printer Section consists of three major assemblies:

-Printer Assembly
-Paper Feed Assembly
-Ribbon Feed Assembly

PRINTER ASSEMBLY

The Printer Assembly consists of the following five sub-assemblies:

-Counter Unit
-Character Drum
-Carriage
-Carriage Brake
-Printer Service Mechanism

ASSEMBLY

Counter Unit

The function of the Counter Unit is to signal the ECU (Electronic Computing Unit) when to energize an electromagnet which fires a print hammer. The Counter Unit consists of a Strobe (1) and Pick-Up Coil (2), and the AW Micro-switch (3).

The Strobe and Pick-Up Coil interact to generate pulses which are counted by the ECU to determine when the Print Hammer should be fired. These pulses are generated by each of the slugs (A) of the Strobe (1) as they rotate past the Pick-up Coil (2). The AW microswitch serves to signal the ECU when it should start counting the pulses generated by the Strobe and Pick-up Coil.

Character Drum The Character Drum (4) is a metal cylinder with raised symbols and numbers. There are 28 lateral printing positions or columns on the Character Drum, however, only 27 print since one is a space. The Drum is powered by the Servo Shaft (not shown) through pulleys and belts. Whenever the machine is on, the Drum is rotating.

Carriage Figure 29

The P101 prints in the serial mode, that is, the characters and numbers are printed in succession rather than simultaneously. The Carriage accomplishes this by moving the Print Hammer (5) laterally one character position for each revolution of the Character Drum (4) during each printing sequence. The main components of the Carriage are the Worm Gear Follower (6) and the Print Hammer (5).

When the Worm Gear Follower (6) is engaged with the Rotating Worm Gear (7), the Carriage is moved to the left. The Print Hammer (5) strikes the Character Drum (4) creating an impression of a number or symbol on the paper tape.

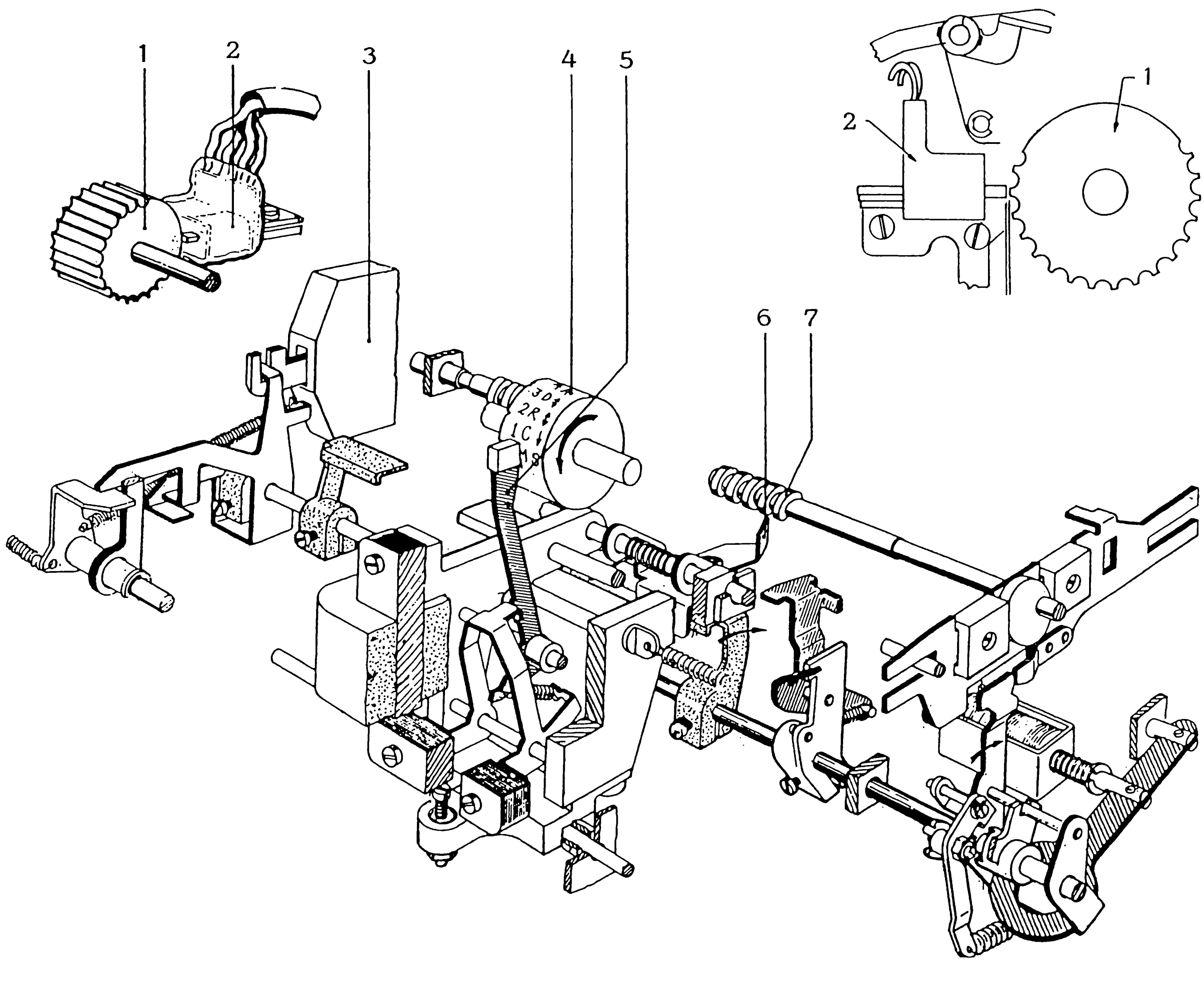


Figure 29

Carriage Brake Figure 30

The Carriage Brake functions to control the speed of the Carriage in the return direction, to lessen shock as it strikes the limit stop. The main components of the Carriage Brake are: Brake Gear (9) and Shaft (10); Brake Housing (11), Brake Shoes (12) and Brake Ratchet Plate (13).

The Brake Gear (9) is always engaged with Brake Rack (8). All the Brake components are mounted in the Brake Housing (11). The inside of the Housing acts as the braking surface. During Carriage travel to the right, the Shaft (10) applies the movement of the Brake Gear (9) to the Brake Ratchet Plate (13), and the Brake Shoes (12) are thrown outward by centrifugal force against the surface of the Housing (11), creating the friction necessary to slow the Carriage.

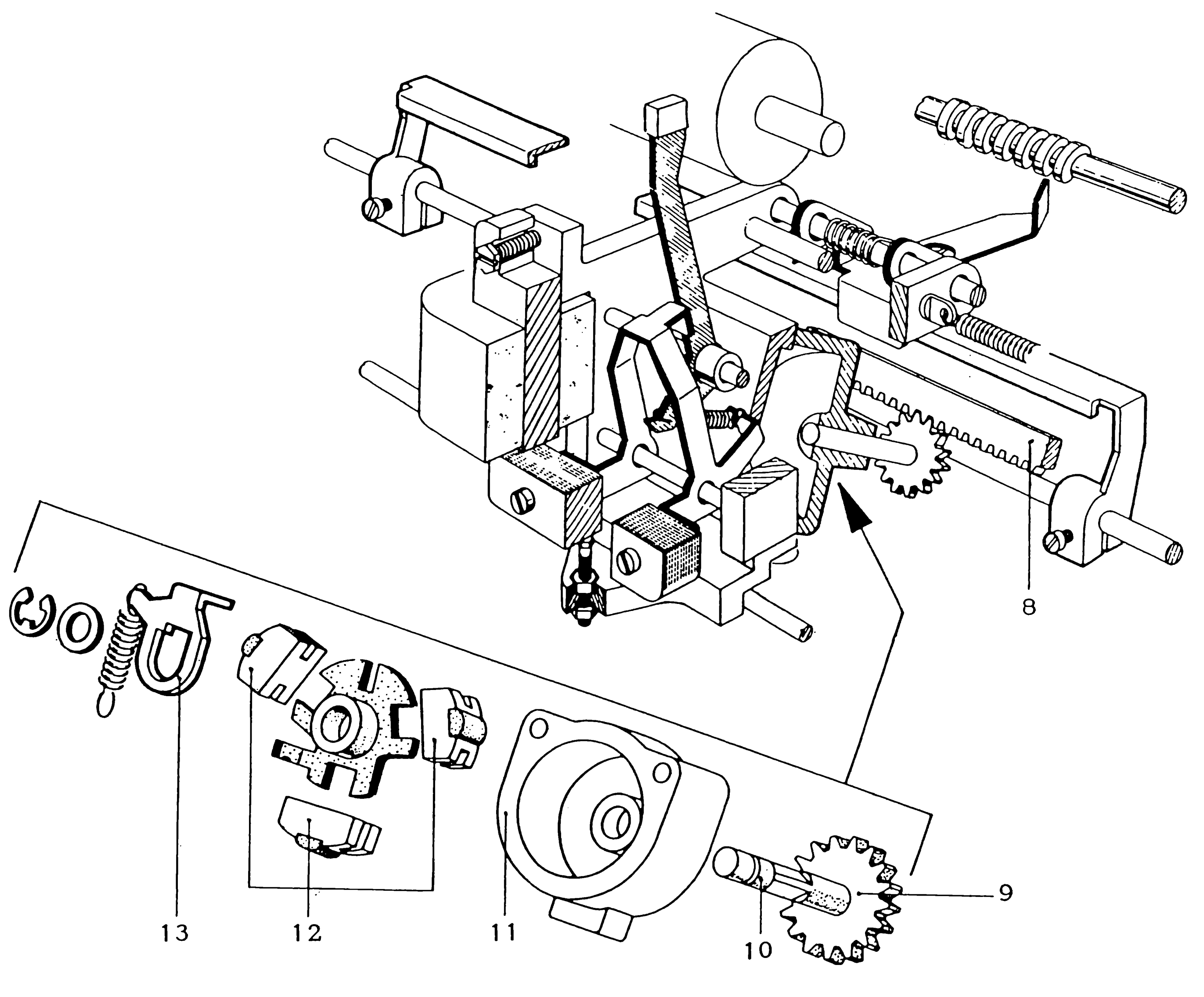


Figure 30

Printer Service Mechanism Figure 31

All the functions accomplished by the Printer Assembly (such as printing, line spacing, and ribbon feed) are dependent upon the Printer Service Mechanism for either their presetting or actuation. The main functional components of the Printer Service Mechanism are the Service Plate (1), the Printer Solenoid (3), the Printer Control Arm (4) and printer Control Shaft (5).

Driven by cam (2), a function of the Service Plate (1) is to position the Printer Control Arm (4) and Shaft (5) to either the working or rest position. Whenever printing and its related functions are required, the Printer Solenoid (3) is energized by a signal from the ECU. Energizing the solenoid causes the Printer Control Arm (4) to rotate the Shaft (5). Rotation of the Shaft serves to preset and actuate the printer functions.

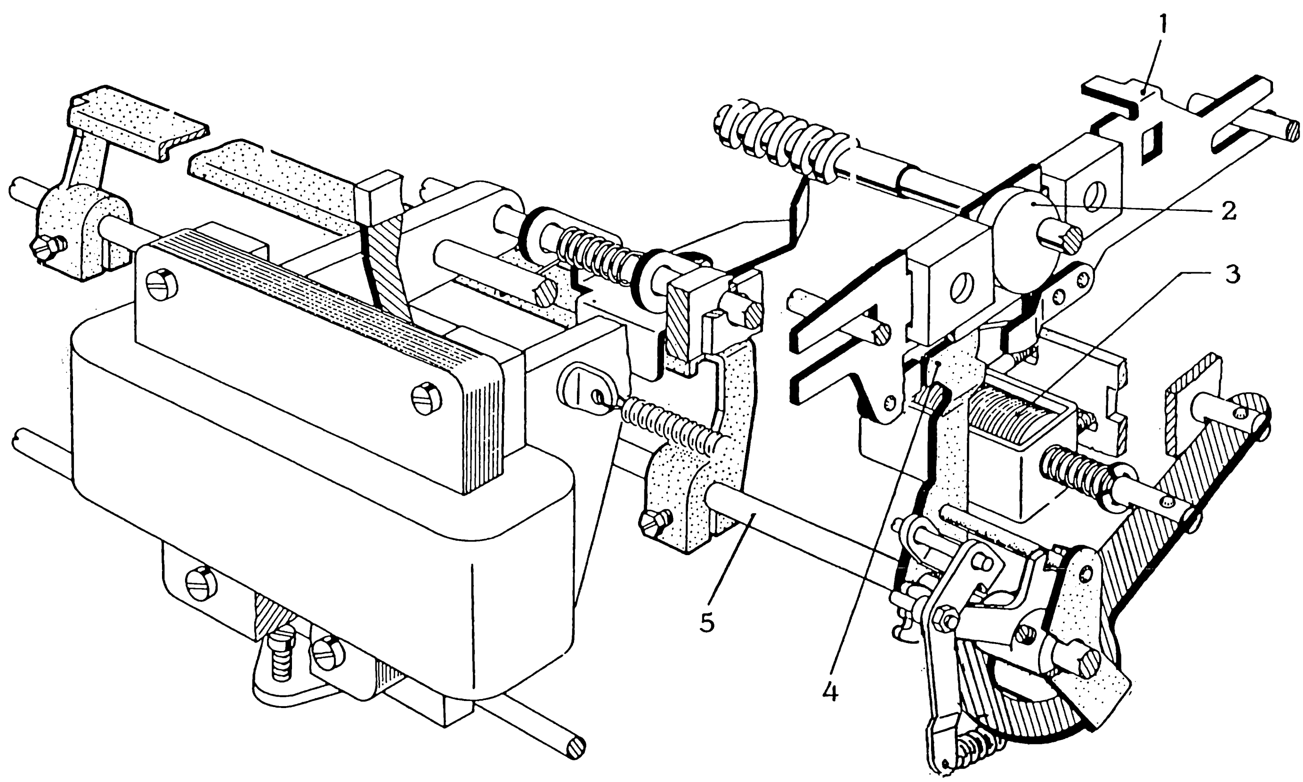


Figure 31

PARTS MOVEMENT Figure 32

The Strobe (1), Character Drum (4), Worm Gear (8), Service Plate (10), and Service Cam (9), derive their power from the Servo Shaft. Therefore, whether printing is required or not, they will always be in motion while the machine is on. When printing is not required, (Printer Solenoid (11) deenergized), the following conditions exist:

-Through Link (14), Spring (12) of Plunger (13) positions Bridge (15) to the right against the Collar (16) with the extension (A) in the path of the lug (B) of the Service Plate (10).

-Print Control Shaft (18) is held in the rest position by Detent (17).

-The Carriage Engagement Bail (26) mounted on the Shaft (18) holds, by means of a wing (C), the Worm Gear Follower (7) away from Worm Gear (8).

-The Printer Carriage, under the action of a Spring (21), is resting against the Rubber Bumper mounted on Shaft (19). When in this position, the Carriage holds the Shaft (22) rightward, positioning the wing (D) of the Crank (28) out of the path of the extension (E) of the Lever (30).

-The Crank (27), also mounted on the Shaft (18), is away from the AW microswitch Actuating Lever (30), allowing the Spring (31) to position the Lever (30) so that the plunger (F) is maintained in the outward position.

When printing is required, the ECU sends a signal which energizes the Printer Solenoid (11). The Plunger (13) is retracted, causing:

-The Link (14) to position the extension (A) of the Printer Control Bridge (15) in the path of the lug (G) of the Service Plate (10).

-As the Service Plate (10) moves rearward, the lug (G) contacts the extension (A), rotating the Print Control Bridge (15) in the direction of the arrow.

-Rearward rotation of Bridge (15) rotates the Shaft (18) through the Collar (16) which is fixed to the Shaft.

-Rotation of the Printer Control Shaft (18) moves the Carriage Engagement Bail (26) rearward, allowing Spring (6) to engage the Worm Gear Follower (7) with Gear (8), and rotates Crank (27) which, through the Lever (30), moves the AW Micro-switch plunger (F) in.

-As the Carriage is moved to the left, the Spring (29) moves crank (28) to the left, positioning the wing (D) under the extension (E) of the Lever (30).

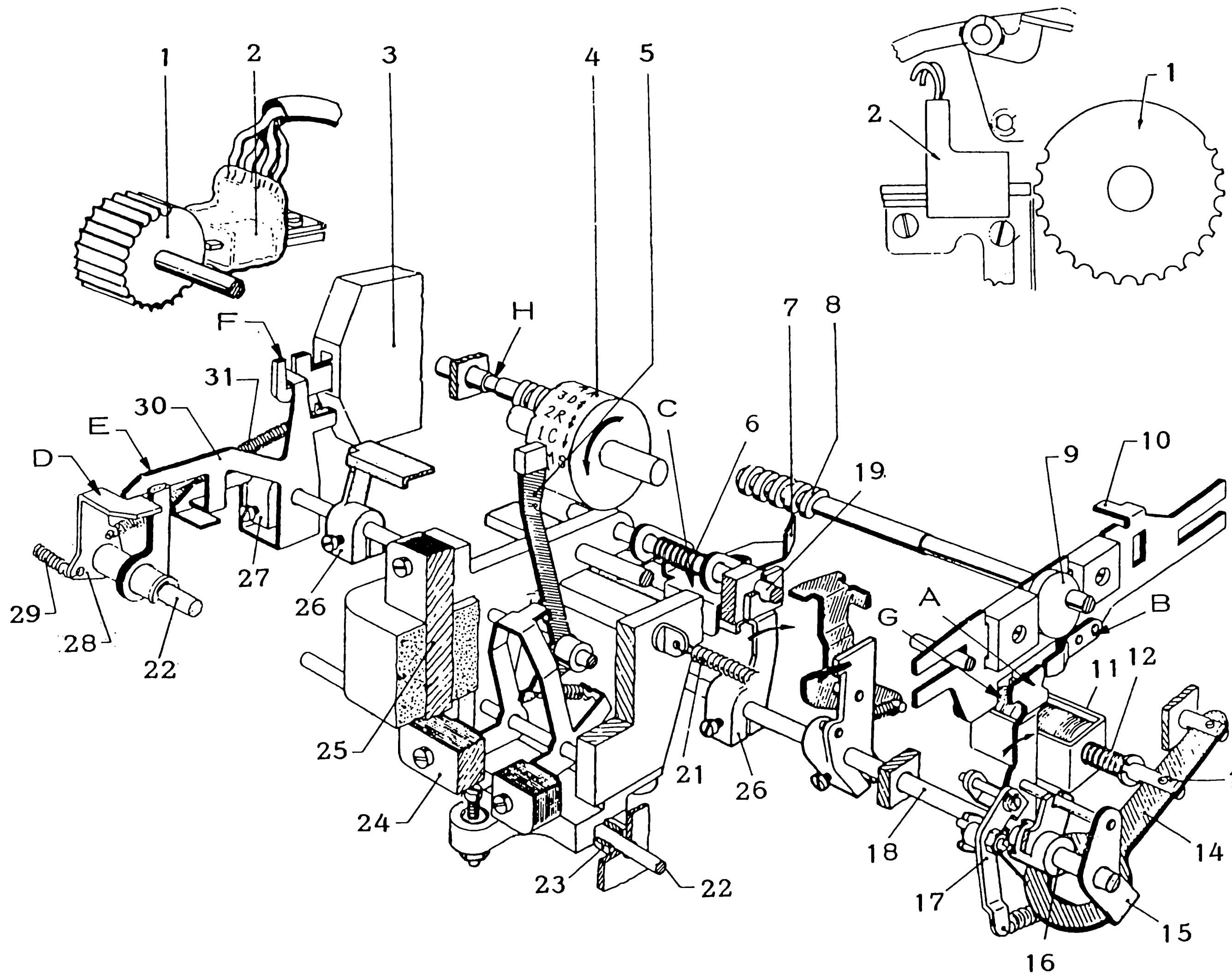

1
2
3
4
5
H
F
31
30
E
D
29
28
22
27
26
C
6
7
8
19
9
10
A
B
G
11
12
13
14
15
16
17
18
21
26
25
24
23
22
3D
2R
1C
1S

Figure 32

Figure 33

With the carriage engaged for travel toward the left, and the AW Microswitch Plunger (F) in, conditions are preset for printing. When the ECU sends the signal, the Electromagnet (25) is energized, making the armature (24) rotate upward and firing the Print Hammer (5). When the Hammer is fired, it forces the ribbon and paper tape against the raised symbol or numbers of the Character Drum (4), resulting in an inked impression on the tape. When the printing sequence is completed, the ECU de-energizes the Print Solenoid (11) and the following takes place:

-The Plunger (13) moves to the right under tension of the Spring (12), causing Link (14) to position the extension (A) of the Control Bridge in the path of the lug (B) of the Service Plate (10).

-As the Service Plate moves forward, the Lug (B) contacts extension (A), rotating the Control Bridge (15) in the direction opposite to the arrow, thus rotating the Printer Control Shaft (18) back to the rest position.

-As the Shaft (18) returns to rest, the Bail (26), by means of wing (C), disengages the Follower (7) from the Gear (8). This allows the Carriage to start its return to rest under tension of the Spring (21).

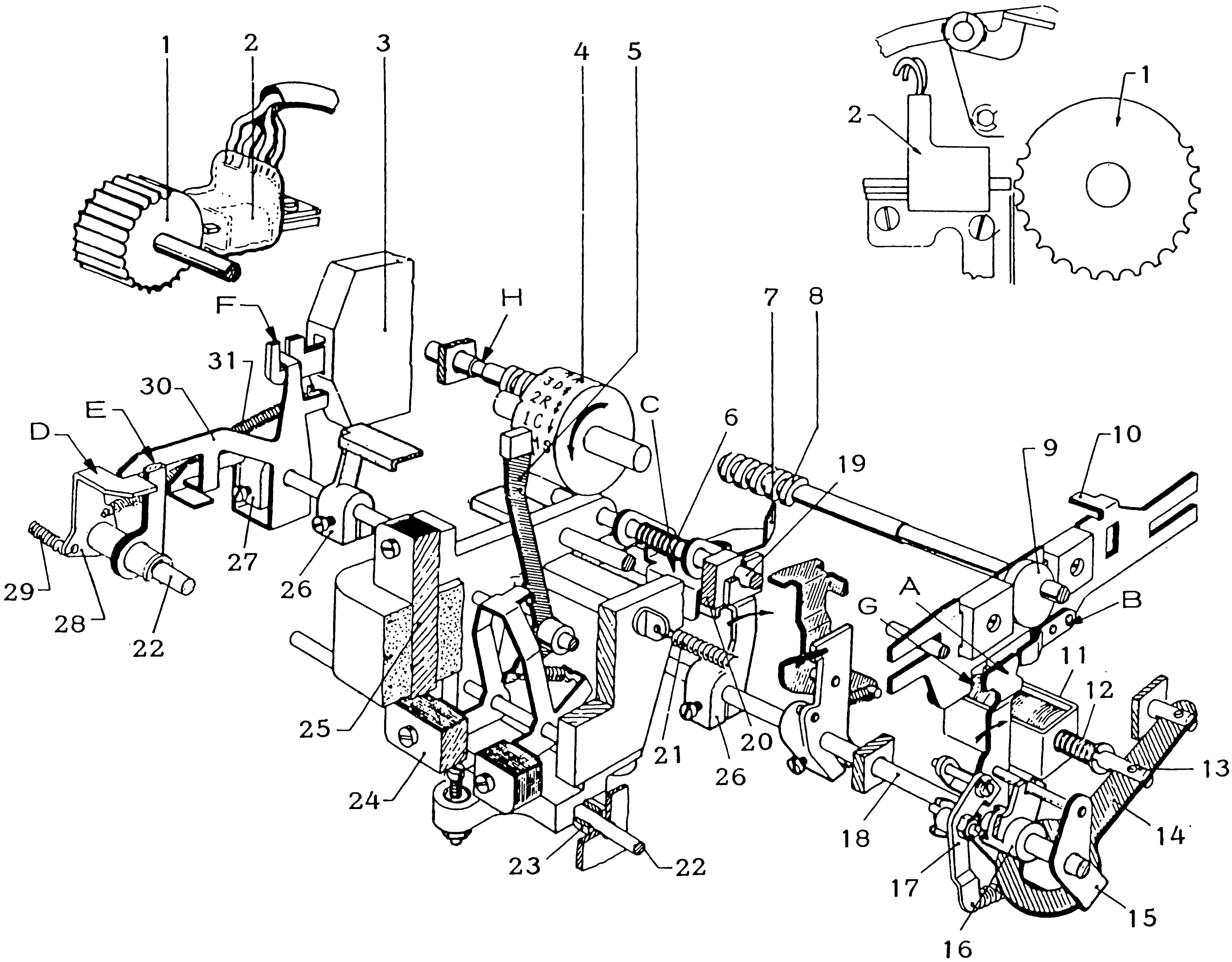
-The Crank (27) rotates, allowing the Spring (31) to rotate the Lever (30) until it limits against the wing (D) of the Crank (28).

-As the carriage approaches the rest position under tension of the Spring (21), the carriage frame contacts the Collar (23) which is fixed to the Shaft (22), moving it toward the right.

-The Shaft (22) movement causes the wing (D) to release the extension (E), which under tension of Spring (31) will move the Plunger (F) outward.

-With the outward movement of the AW Microswitch Plunger, the printing sequence is completed.

> Note: If, due to a machine malfunction, the Carriage Engagement Solenoid (11) has failed to de-energize, the carriage will travel fully leftward. The Follower (7) will be positioned in cutout (H), permitting the carriage to idle and preventing damage.



1
2
3
4
5
H
F
31
30
E
D
29
28
22
27
26
25
24
23
22
C
6
7
8
19
21
20
26
9
10
A
B
G
11
12
13
14
15
16
17
18

Figure 33

When the Carriage is at rest, the condition of the Carriage Brake (figure 34A) is as illustrated in figure 34B. When the carriage is moving to the left for printing, no braking is desired. Figure 34C shows how the shoulder (B) of the Brake Ratchet Plate (6) is pushed upward against the Spring (7) until the cam lobe of the Brake Shaft (2) clears the shoulder (B), causing ratcheting action and allowing the free clockwise rotation of the Brake Shaft without rotation of the braking parts.

When the carriage has been released and is moving to the right, braking is desired. Figure 34D shows that when the Brake Shaft (2) rotates in a counterclockwise direction, shoulder (B) of Brake Ratchet Plate (6) engages the faces of the Brake Shaft and the brake parts are caused to follow this rotation. Braking action is produced when the Brake Shoes (4) of the Brake Shoe Guide Plate (5) move outward against the inner surface of the Brake Housing (3) by centrigugal force. Friction Pads (A) of the Brake Shoes (4) create drag against Housing (3), effecting a reduction in speed of the Carriage through Gear (1).

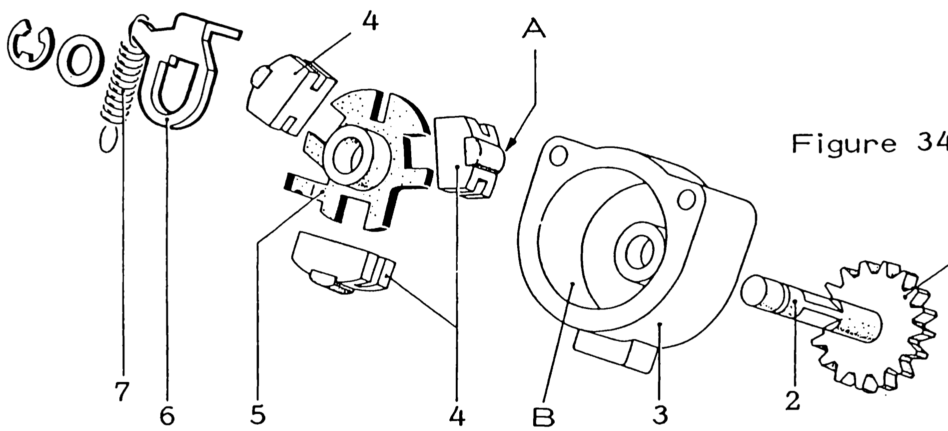


Figure 34A.

Figure 34B

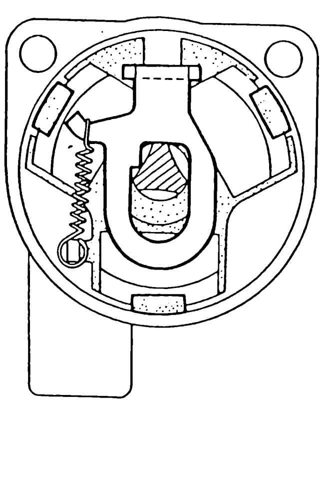


Figure 34C

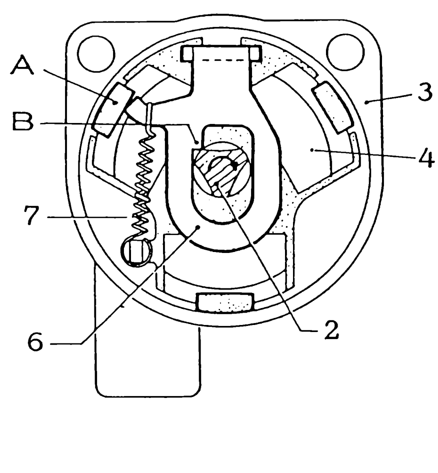


Figure 34D

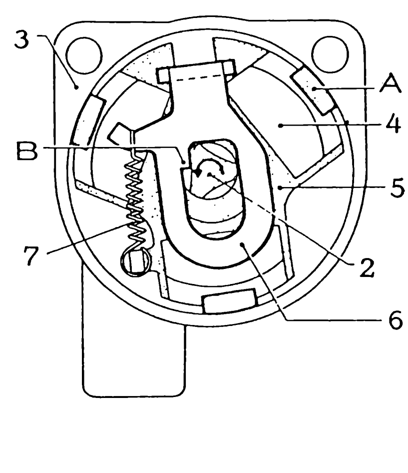


Figure 34

ADJUSTMENTS

Because the Worm Gear, Character Drum, and Strobe Pickup Coil clearance affect the overall operation of the Printer Assembly, they are usually checked first. They are basic adjustments; subsequent adjustments may be dependent upon their proper execution. These three adjustments should be made with the power off.

Worm Gear. Refer to figure 35A The Worm Gear (2) must have freedom of rotation and at the same time have a minimum of side play. To adjust:

- Loosen the Collar (1) and take up the side play of the Worm Gear (2) to the right.
- Position the Collar fully left, and tighten the two screws.
- Ensure that the Worm Gear rotates freely and that side play has been minimized.

Character Drum Lateral Position. Refer to figure 35B. This adjustment is made to allow complete free Drum rotation while eliminating all perceptible end-play from the shaft. To adjust:

- Loosen the setscrew of the Strobe Wheel (3) and the small Gear (7) on the Character Drum Shaft, and position them so that the Character Drum (4) has equal clearance between the two large Paper Feed Wheels (5).

- Using a Straight edge, align the Strobe Wheel (3) setscrew midway between the numeral 6 (preceded by FX) and 7 (preceded by E÷), as shown in the figure 38B and secure it in this position.

Strobe Pickup Coil Clearance. Refer to figure 35C. Rotate the Strobe Wheel (3) and visually check that there is a minimum of clearance between it and the pickup Coil (9). To adjust clearance:

- Loosen the two screws on the Pickup Coil.

- Push the poles of the Pickup Coil against the Strobe Wheel; then obtain a minimum running clearance (A). Tighten the screws while carefully maintaining this clearance.

Note: Clearance A is critical and must be kept to a minimum.

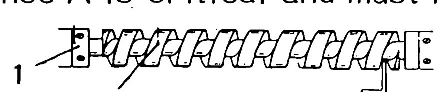


Figure 35A

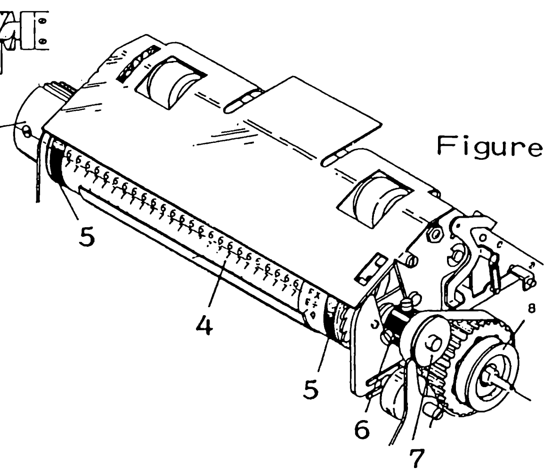


Figure 35B

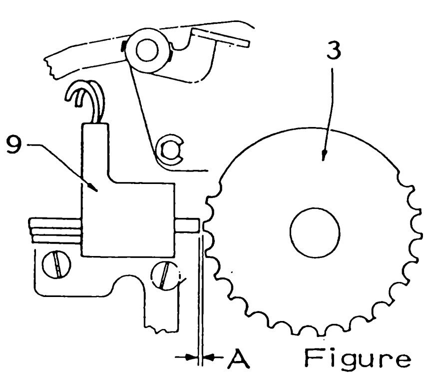


Figure 35C

Figure 35

AW Gap-Timing (Strobe Wheel) (Figure 36A).

Rotate the Pulley (3) clockwise until the Service Plate just begins rearward movement. The symbol "exchange" (↕) at the extreme right of the Character Drum (8) should be under the Print Hammer at this point. If it is not:

-Loosen the two screws in the Collar (1) which clamps the small Pulley (2) to the Character Drum Shaft.

-While preventing any further rotation of the Pulley (3), turn the freed Character Drum (8) by hand so that the symbol "exchange" (↕) falls completely under the Print Hammer face. Tighten both screws in the Pulley Collar (1).

-Check that the alignment of the Service Plate and Character Drum is accurate, as described above.

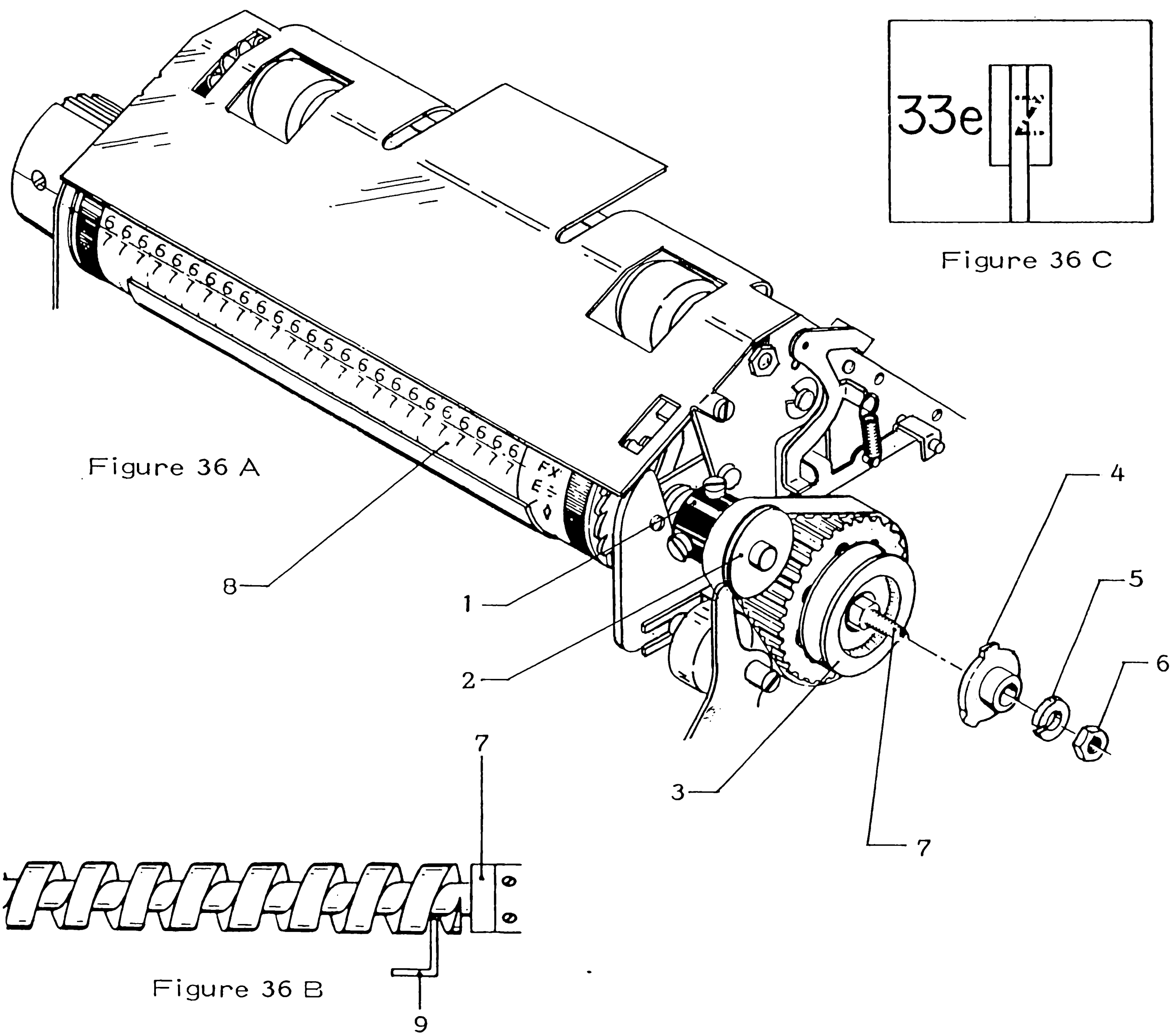


Figure 36 C

Figure 36 A

Figure 36 B

Figure 36

Print Hammer (Lateral Position). Depress and hold the Print Solenoid Plunger while turning the Drive Pulley (3), figure 36A, clockwise. The Worm Gear Follower (9) should engage the Worm Gear (7) as illustrated in figure 36B. If this condition occurs, perform steps 4 through 6 below; if this condition does not occur, perform steps 1 through 6 below.

1. Remove the Nut(6), Washer (5) and Locking Flange (4) that lock the Worm Shaft (7) to the Pulley (3).

2. While holding the Pulley (3) steady in this position, rotate the Worm Shaft (7) until the Worm Gear Follower (9) positions with respect to the Worm Gear as shown in figure 36B.

3. Replace the Locking Flange, Washer and Nut to complete the adjustment.

4. Depress and hold the Printer Solenoid while turning the Drive Pulley (3) clockwise until the Print Hammer is in alignment with the "Z" as shown in figure 36C. If this condition cannot be achieved:

5. Remove the Nut (6), Washer (5) and Locking Flange (4) that lock the Worm Shaft (7) to the Pulley (3).

6. With a pair of needle nose pliers rotate the Worm Gear (7) slightly until correct alignment is achieved.

Print Cutoff Adjustment Enter and print the number 909090909090909090, and observe whether or not the characters are cut off on either side, top or bottom. If the tops or bottoms are missing, advance or backup the Strobe Wheel. If the sides are cut off, perform the Print Hammer (lateral position) adjustment.

Print Hammer Fig. 37 Print various groups of numbers, with decimals entered, for several functions of machine operations: addition, subtraction, multiplication, and division. Advance and tear off this section of paper tape. Examine the tape for characteristics of clarity of the printed digits (not cutoff), decimal embossing or excessive ribbon wear. An optimum condition should exist whereby embossing of decimals is minimal and yet printed numbers are not faint. If this condition is not met, perform the following:

Hammer Clearance

The clearance between the face of the Print Hammer (1) and the surface of the Character Drum (2) should be 3.17mm (1/8"). Adjust the Screw (3) to obtain this clearance.

Note: After an adjustment of the Screw (3), the following Armature Clearance check must be performed.

Armature Clearance Fig. 37.

-As a preliminary step, the clearance between the Print Magnet (4) and its movable Armature should be set at ~~0.8~~mm. 0.2mm Loosen both screws (5), and adjust the Print Magnet up or down while keeping a 0.8mm (0.031") flat gauge between the magnet and armature (as a spacer); then tighten the screws and recheck the gap. Do not use more than a light downward holding pressure on the Coil while this adjustment is being made.

-Print with the machine, and again examine the tape. If the paper is embossed, reduce the armature clearance to eliminate the condition.

Note: After making Hammer Clearance and Armature Clearance adjustments, it will be necessary to check the Strobe Wheel timing as these two adjustments have an effect on lead time.

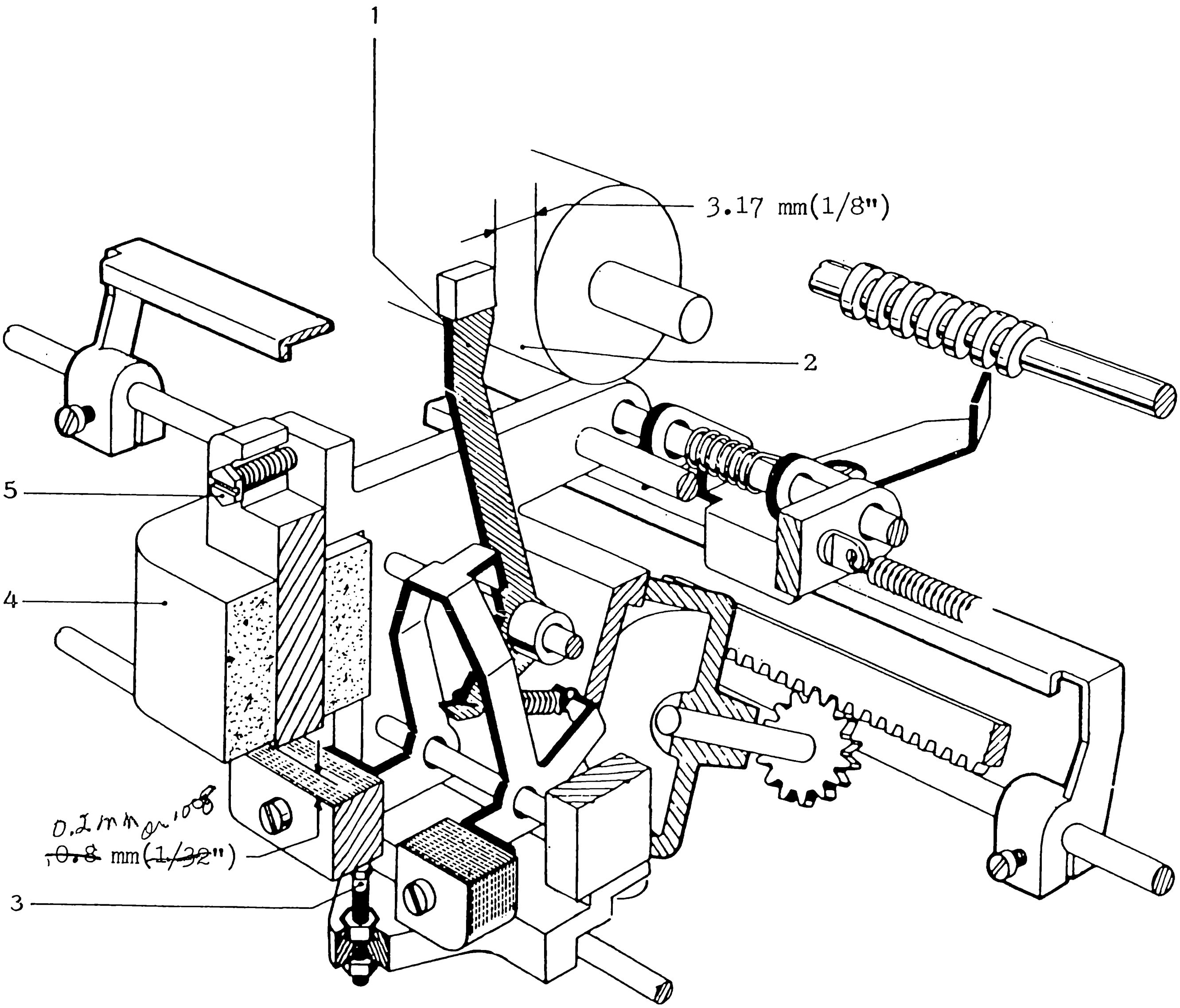


Figure 37

Printer Control Shaft Adjustments

Lateral Position of Printer Control Shaft.

Refer to figure 38. Check that the amount of projection of the Printer Control Shaft (4) through the Lever (2) is 0.5 mm. Check the play in the Shaft (4) by moving it from left to right. Movement should be minimal.

To adjust for the Shaft projection:

-Loosen the screws of the Crank (1) and of both cranks of Carriage Control Bail (3).

Position the Lever (2) and the Crank (1) to the right against the Printer Unit Side frame (8). Position the Shaft (4) for the required projection, and tighten the screw of Crank (1).

To reduce the play of Shaft (4):

-Remove its play to the right.

-Move the Carriage Control Bail (3) to the left against the side frame, and tighten the screws of both cranks.

Control Bridge Alignment (figure 38).

With the machine at rest, the arm (B) of Bridge (6) should be directly in front of the lug (A) of the Service Plate (5). Verify that the Service Plate is in the forward position. Depress Plunger (2) into the energized position (figure 39). The arm (B) should now be positioned behind the lug (C) of the Serivce Plate.

To make the adjustment for the rest position:

-Loosen the screw of Detent (7), and position Control Bridge (6) against the left side of the detent.

-Maintaining the two parts together, align them so that arm B of Control Bridge (6) is aligned with extension A of Service Plate (5). Tighten the setscrew of Detent (7) on the flat of the Print Control Shaft (4).

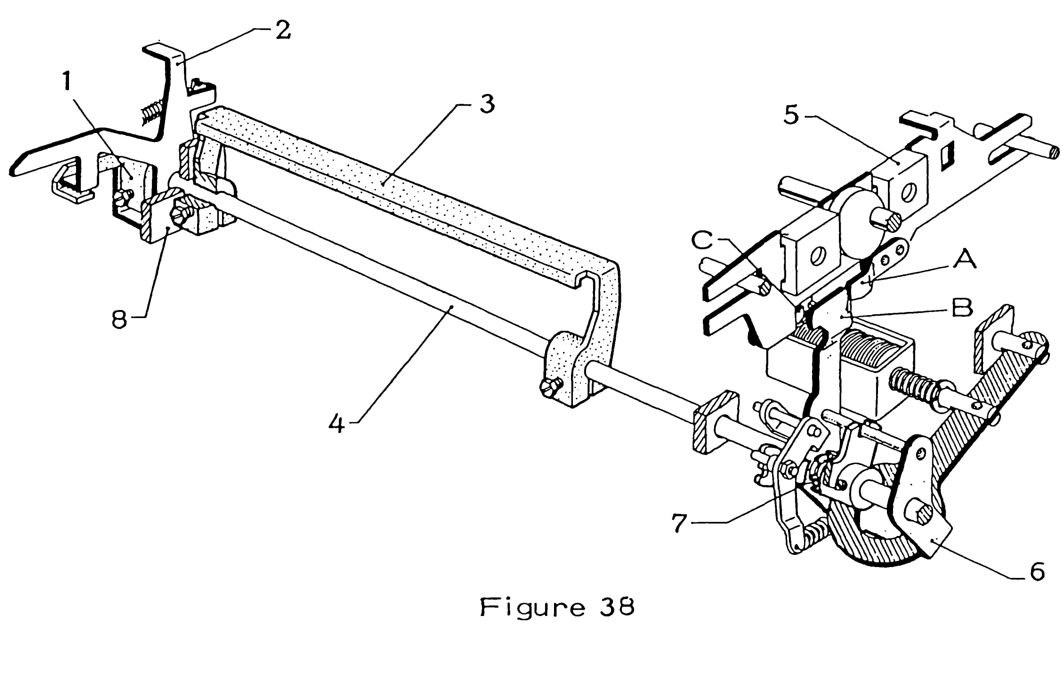


Figure 38

To adjust for the energized condition of the solenoid (figure 39):

-Loosen the two Screws (1), and move the Printer Solenoid (3) to the right.

-Push Plunger (2) into the fully energized position. Maintaining this compressed condition, move the plunger and solenoid to the left until the extension (B) of Bridge (6) is in line behind extension (C) of the Service Plate (5) and tighten the two Screws (1).

CAUTION: Printer operation depends primarily on the proper function of the Print Solenoid. To obtain the most reliable operation of the associated mechanism, the plunger must be free of any bind. Do not oil the plunger or soleñoid under any circumstances as this will cause hydraulic locks to occur and prevent maximum plunger movement.

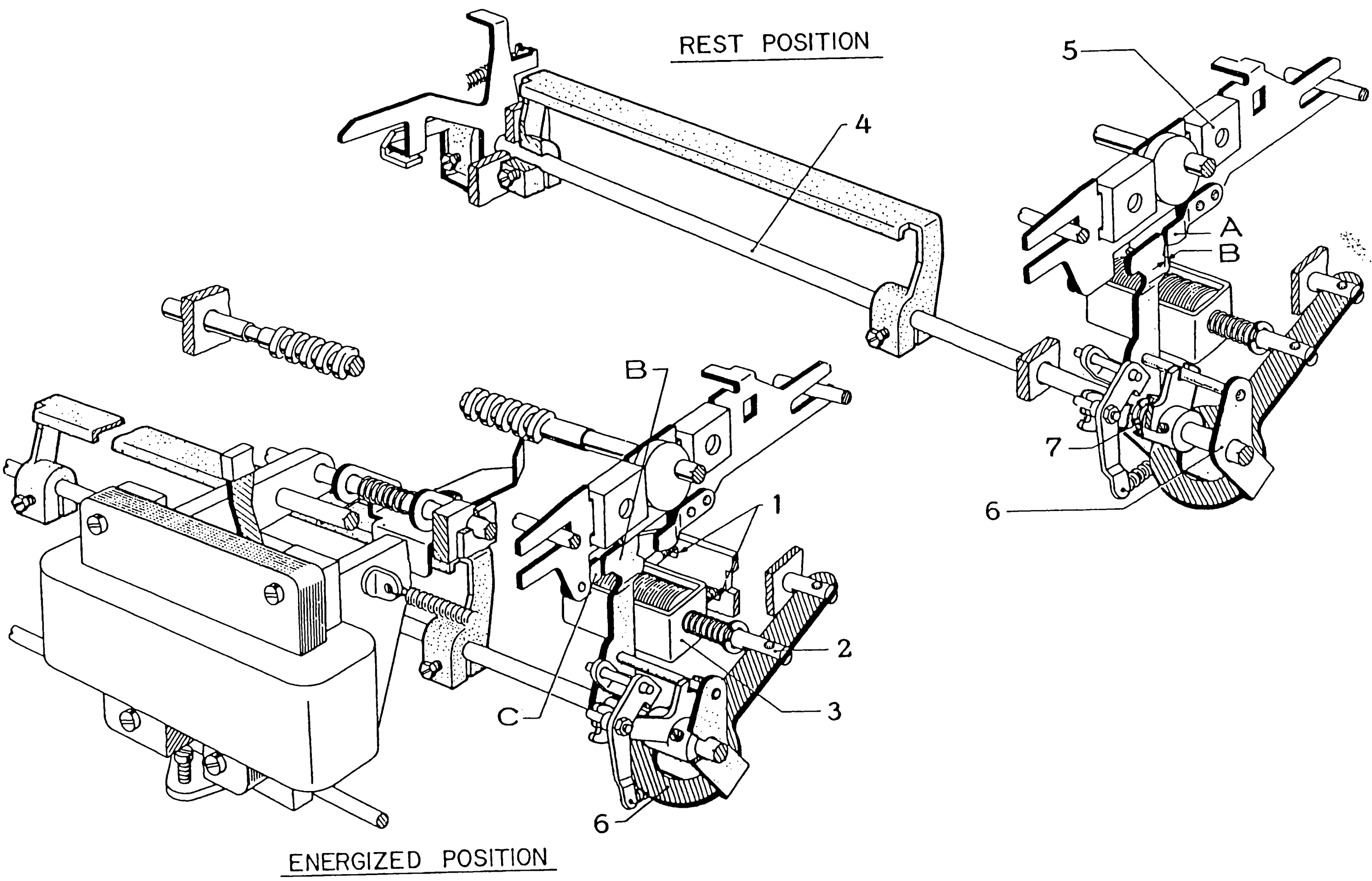


Figure 39

Microswitch Activating Crank and the AW Microswitch (figure 40A)

Rotate the Printer Control Shaft (5) to its working position. Check that with the microswitch plunger (B) against the switch body (3), the wing (C) of Lever (2) is not contacting either side of the cutout of the plunger (B). At the same time, there should be a clearance of 0.2 to 0.5mm between the extension (A) of the Lever (2) and the wing (D) of the Crank (6). If either of these conditions are not present:

-Loosen the AW Microswitch mounting Screw (4).

-With the Printer Control Shaft (5) still in its working position, loosen the screw of Crank (1) and adjust the position of the Crank (1) so that the horizontal tip (A) of the Microswitch Actuating Lever (2) is above the level of lip (D) of the microswitch Release Crank (6).

-Set the clearance between A and D to the clearance specified above and tighten the screw.

-Position the AW Microswitch so that the white nylon plunger is in against the switch body, and the upper wing of the Actuating Lever has sufficient clearance to allow the plunger to stand free of the extension. Tighten the Screws (4).

Note: Do not disturb the lateral position of the Crank (1) during this adjustment.

Carriage Control Bail (Figure 40B)

With the Printer in its rest position, check that the Worm Gear Follower (3) just clears the outer diameter of the Worm Gear (2). Check for the small, but equal, clearance (A) at both ends of the Worm Gear. Should adjustment be necessary:

-Loosen the Screws (4) on the cranks of the Control Bail (1).

-Position the cranks angularly, and tighten both Screws (4) on the cranks of the Control Bail (1).

Note: Do not disturb the lateral position of the Control Bail (1).

Microswitch Release Crank (Fig. 40C)

With the power on, enter several digits and depress a plus key. After printing has occured, manually prevent the carriage from returning to reset and check the following:

-The Shaft (2) must be in its extreme left position with its retaining clip (3) limiting against the left side frame (4) of the Printer Unit.

-The wing (A) of Crank (6) must be below the extension (B) of Lever (1).

If these conditions do not exist, ensure that:

-The Shaft (2) is free of binds
-Spring (5) is neither stretched or damaged

Allow the carriage to return to its rest position. As this occurs, ensure that Shaft (2) and Crank (6) move toward the right, removing the wing (A) from under the extension (B) of the Lever (1).

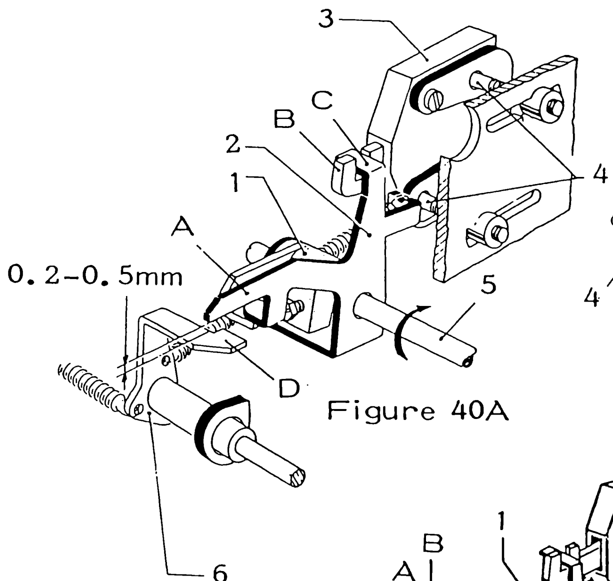


Figure 40A

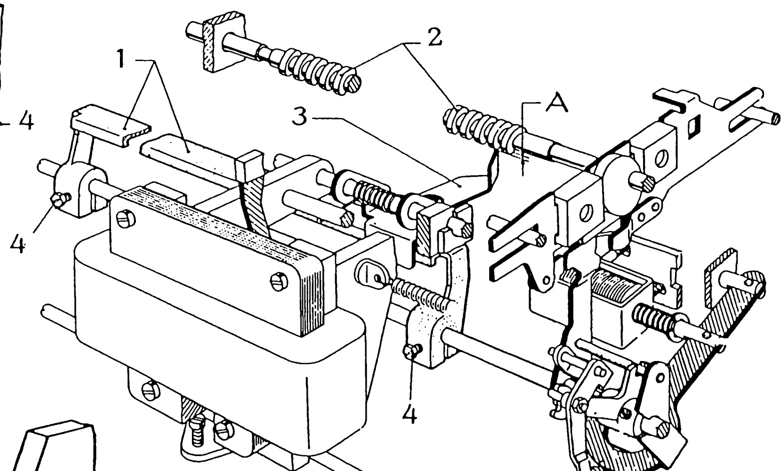


Figure 40B

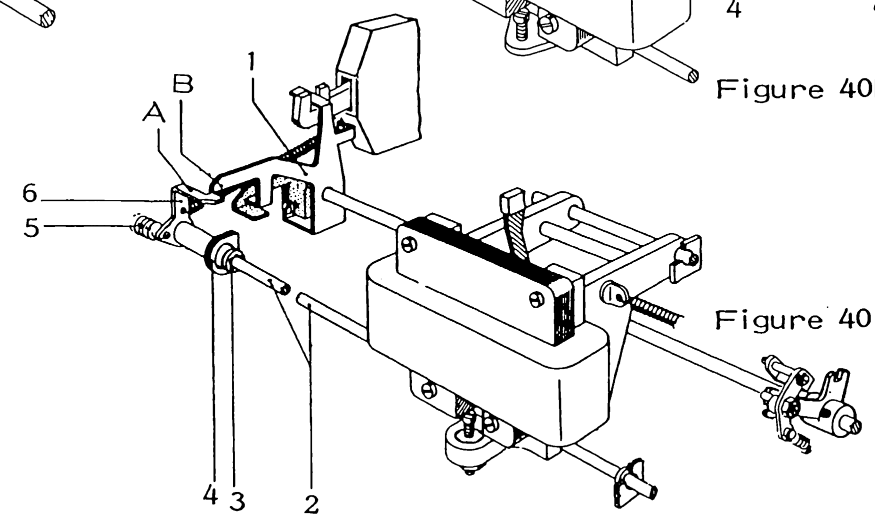


Figure 40C

Figure 40

Carriage Brake (Figure 41)

With the machine at rest, manually move the carriage to the extreme left of its travel and release, observing whether or not it returns properly. If any of the following conditions exist, perform the corrective actions while checking each part for damage or wear.

-Slow carriage return.

-Normal return, but the carriage slows greatly or stops before reaching its rest position.

-Very fast return. The carriage bounces off its stop.

Corrective actions:

-Remove and disassemble the Centrifugal Brake. Ensure that the internal Spring (7) is in good condition.

-Using alcohol, clean all traces of oil or grease from each part.

-Before re-assembly, put a thin coat of white grease (such as Lubriplate) on the entire Brake Shaft (2) and Gear (1), being careful not to touch the Brake Shoes (4) or Drum Friction Surface (B). Any trace of grease or oil on these surfaces will be detrimental to braking action.

Note: If the Brake Assembly seems to function properly and carriage return is still improper, check that the Carriage Return Spring is not stretched or damaged and that the Carriage Support Shafts are properly lubricated.

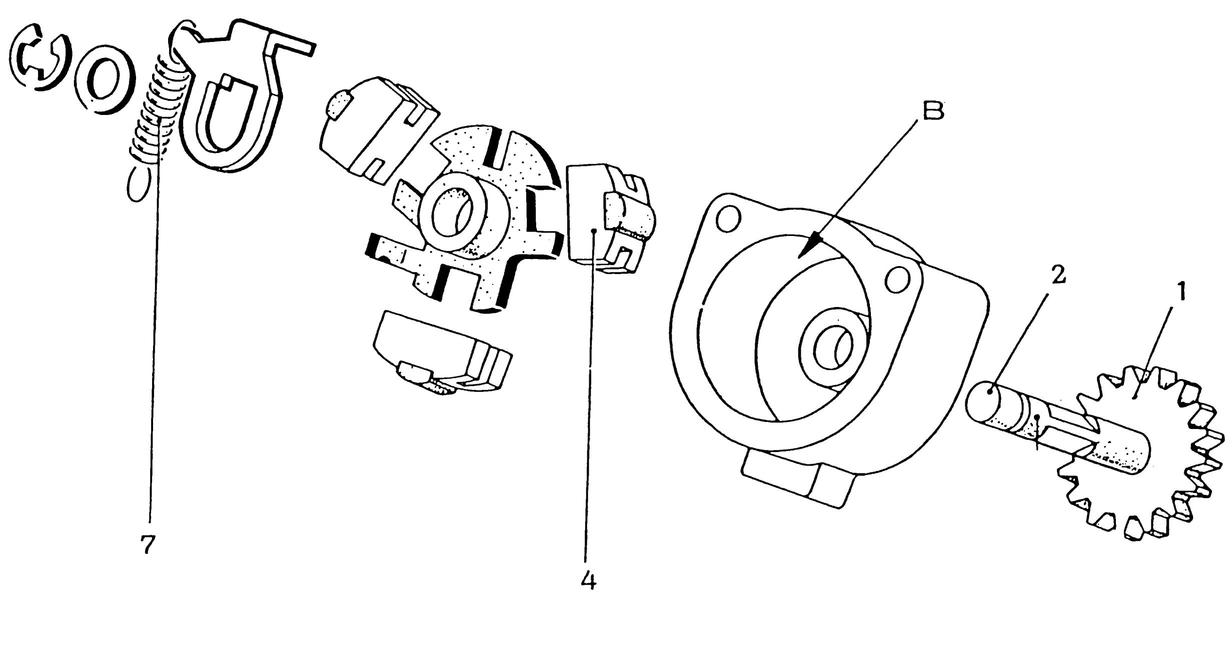


Figure 41

PAPER FEED ASSEMBLY (Figure 42)

The Paper Feed mechanism controls the feed of the paper through the printer, one space at a time. This feed is accomplished:

-Automatically, after a printing sequence has taken place, as the carriage returns to the right.

-Manually, by the depression of the Paper Advance Key (A), which advances the tape in one-step increments as long as the key is held depressed.

The main components of the Paper Feed Assembly are:

-Feed Pawl
-Feed Wheels
-Control Arm
-Control Bridge
-Latch
-Service Plate
-Feed Rollers
-Paper Release Crank
-Paper Pressure Rollers

ASSEMBLY

Feed Pawl When spacing is required, the Feed Pawl (1) engages the Paper Feed Wheels (3), feeding the paper through the printer.

Feed Wheels When activated by the Feed Pawl (1), the Feed Wheels (3) feed the paper through the printer. The Feed Wheels are kept in the position reached by the Detent (4).

Control Arm The function of the Control Arm (5) is to act on the Control Bridge (6), presetting for a spacing operation.

Control Bridge When activated by the Control Arm (5), the Control Bridge (6) presets for the engagement of the Feed Pawl (1) with the Service Plate (7).

Latch The Latch (8) establishes the rest position of Feed Pawl (1), and is used to disengage the Pawl from the Service Plate.

Service Plate The Service Plate moves the Feed Pawl forward to drive the Feed Wheels (3) and associated parts.

Paper Release Crank Rotated when the Paper Release Key is depressed, the wing of the Paper Release Crank (2, figure 46) acts to pivot the Paper Guide and Pressure Rollers out of contact with the Feed Wheels, and by latching to them, retains them in this position.

Paper Pressure Rollers The Paper Pressure Rollers (9), normally apply pressure on the paper tape to hold it against the Feed Wheels (3) for advancement. For paper release functions, the tension on the tape is decreased.

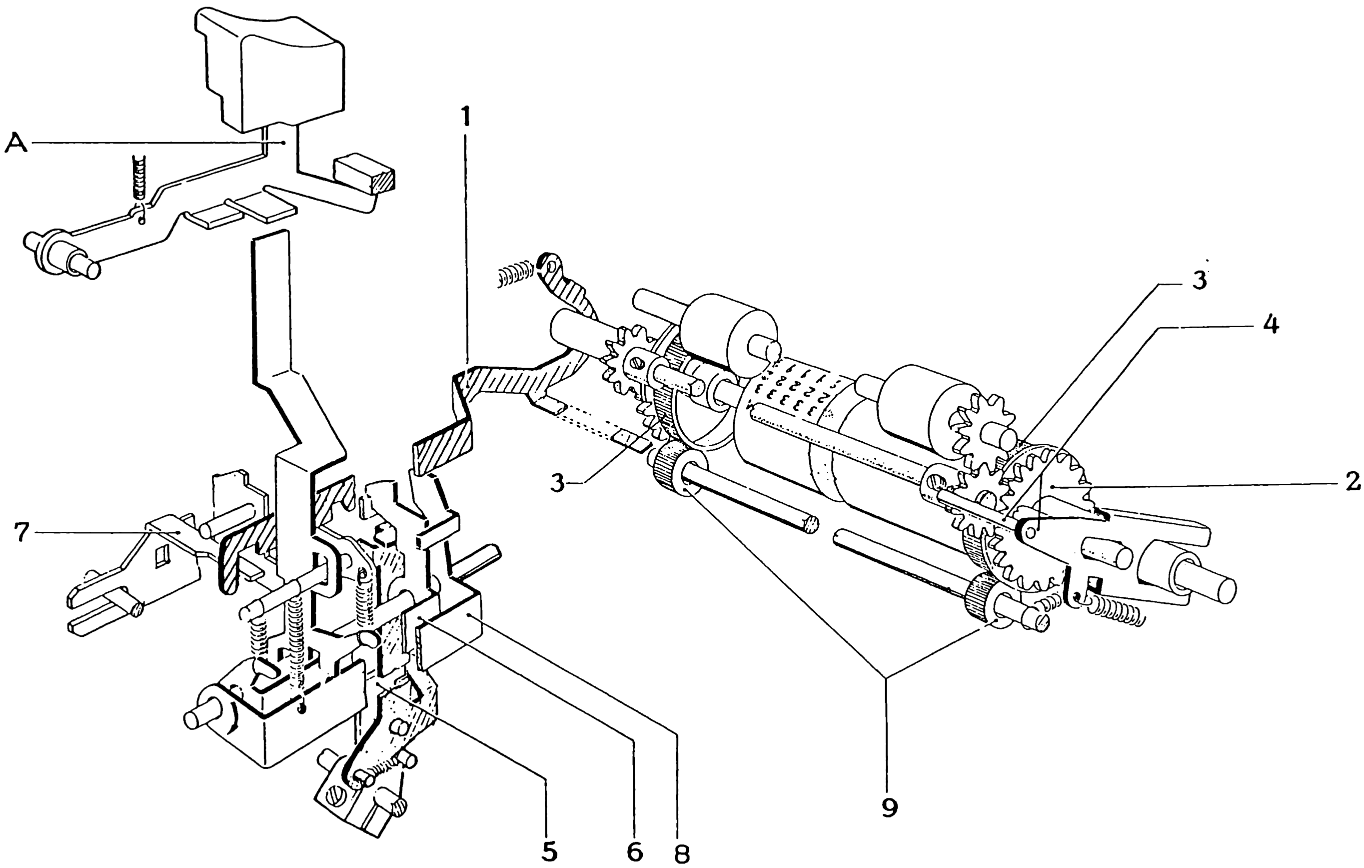


Figure 42

PARTS MOVEMENT

In Figure 43B the Paper Feed Assembly is shown at rest. In this position, the following conditions exist:

- The Paper Pressure Rollers, right and left Paper Feed Gears and Wheels, and the Transmission Shaft are maintained in position by Detent(4, Figure 42).

- Paper Feed Pawl (1) rests on Feed Latch (2) by the action of its spring.

- Control Bridge (3) rests against the Side Frame (7) under the tension of its Spring (4).

- Spring (5) holds the Feed Latch (2) at rest against the Control Bridge (3).

- Control Arm (6) fixed to the Printer Control Shaft (9, figure 43A) is positioned forward away from Control Bridge (3). Repeat Lever (12) rests against Stud (11) under the tension of its Spring (10).

Automatic Operation

At rest or before the Printer Control Shaft has rotated, the relationship between Control Arm (6) and Control Bridge (3) is as shown in the detail of figure 43B. When printing is required, the Print Solenoid is energized, causing the Printer Control Shaft to rotate rearward.

Rotation of the Printer Control Shaft creates the following conditions, as shown in figure 43C:

- Rearward rotation of the Control Arm (6) causes Control Bridge (3) to be rotated toward the left.

- Control Bridge (3) acting on wing (A) rotates Latch (2) toward the left.

- Feed Pawl (1) lowers to rest on surface (B) of Control Bridge (3), figure 43C.

When printing is complete, the solenoid is deenergized, and the Print Control Shaft returns to rest, establishing the following conditions shown in figure 43D.

- Forward rotation of Control Arm (6) allows the Control Bridge (3) and Latch (2) to move toward rest.

- The Latch (2) contacts the Feed Pawl (1), and stops it from going to the rest position.

- The Control Bridge (3) moves fully to rest, creating an opening between the Control Bridge and the Latch (2).

- The Feed Pawl (1), under spring tension, enters the opening that has been created between the Control Bridge (3) and Latch (2).

The full downward movement of the Feed Pawl will allow the engagement of the notch (C) with wing (D) of the Service Plate (8), as shown in figure 43E.

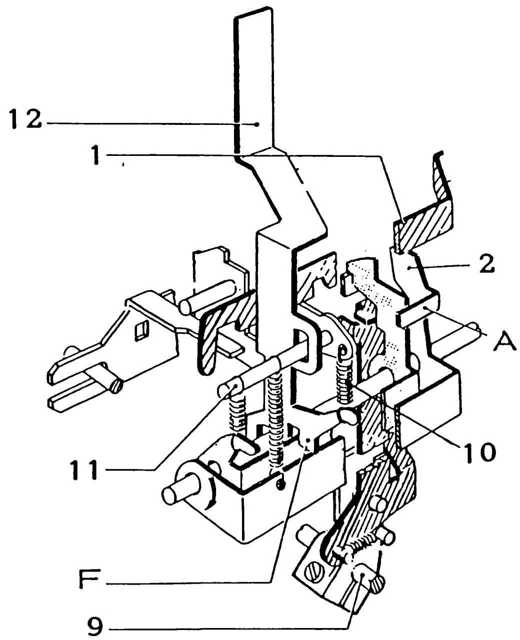


Figure 43A

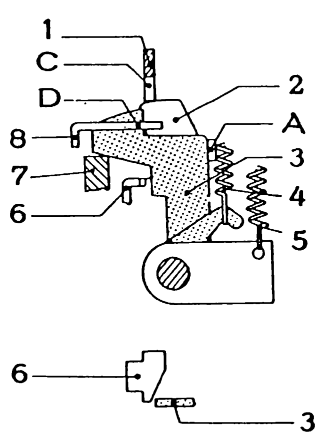


Figure 43 B

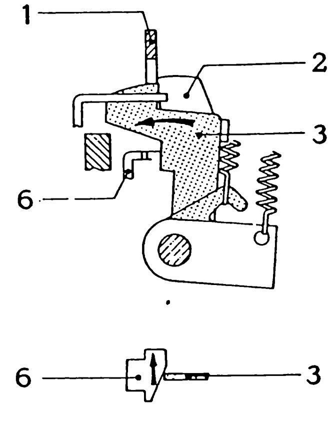


Figure 43C

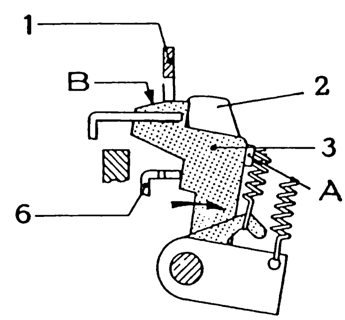
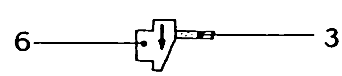


Figure 43D



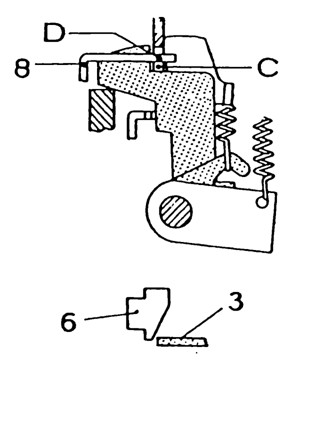


Figure 43 E

Fig. 43

-The next forward movement of the Service Plate will drive the Feed Pawl forward (figure 44A), which will:

-Engage the right Paper Feed Gear (8) with the Feed Pawl (1), causing the one-step spacing of the paper.

-The movement of the Gears (8) is transmitted to Gear (5). The rotation of the Gear (5) causes rotation of the Feed Rollers (4) in the direction illustrated. The rotation of the rollers "slips" the paper along the underside of the papercutter.

-Allow Latch (2) to complete its rotation to rest position as soon as the cutout (E) of the Feed Pawl (1) is positioned, in its travel, as shown in figure 44C.

Rearward movement of the Service Plate in conjunction with the Spring of the Feed Pawl causes the disengagement of the Pawl from the wing of the Service Plate. This results from the camming action of the slot (E) over the Latch (2), as shown in figure 44D. At the end of the spacing operation, the condition re-established is as shown in figure 44E.

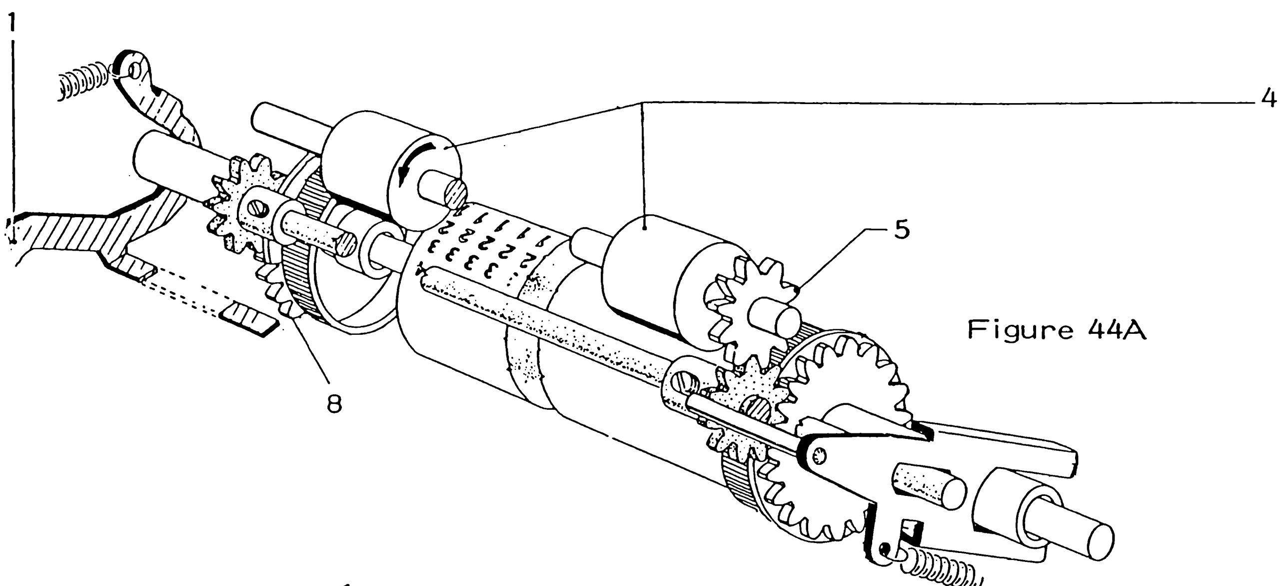


Figure 44A

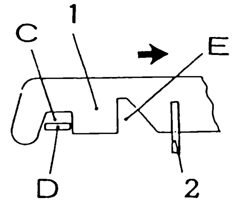


Figure 44B

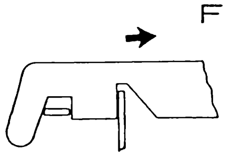


Figure 44C

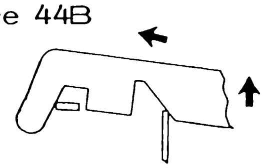


Figure 44D

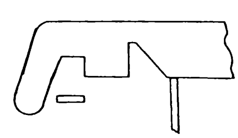


Figure 44E

Figure 44

Manual Operation

We have seen previously (in Automatic Operation), that paper feed was dependent upon the clearance created between the Control Bridge and the Latch that allowed notch (C) of Feed Pawl (1) to engage wing (D) of the Service Plate (figure 45E). This same condition must be achieved to accomplish manual spacing. When Repeat Lever (12), figure 45A, is lowered, the extension (F) rotates the Feed Latch, obtaining the condition shown in figure 45E.

During the time that Repeat Lever (12) is held depressed, there will be repeat spacing. When the Repeat Lever is released, the Paper Feed Latch (2) will start moving toward rest, initiating a sequence of movements indentical to those descrived in Automatic Operation and resulting in the disengagement of the slot (C) from the wing (D) of the Service Plate, as shown in figure 45D.

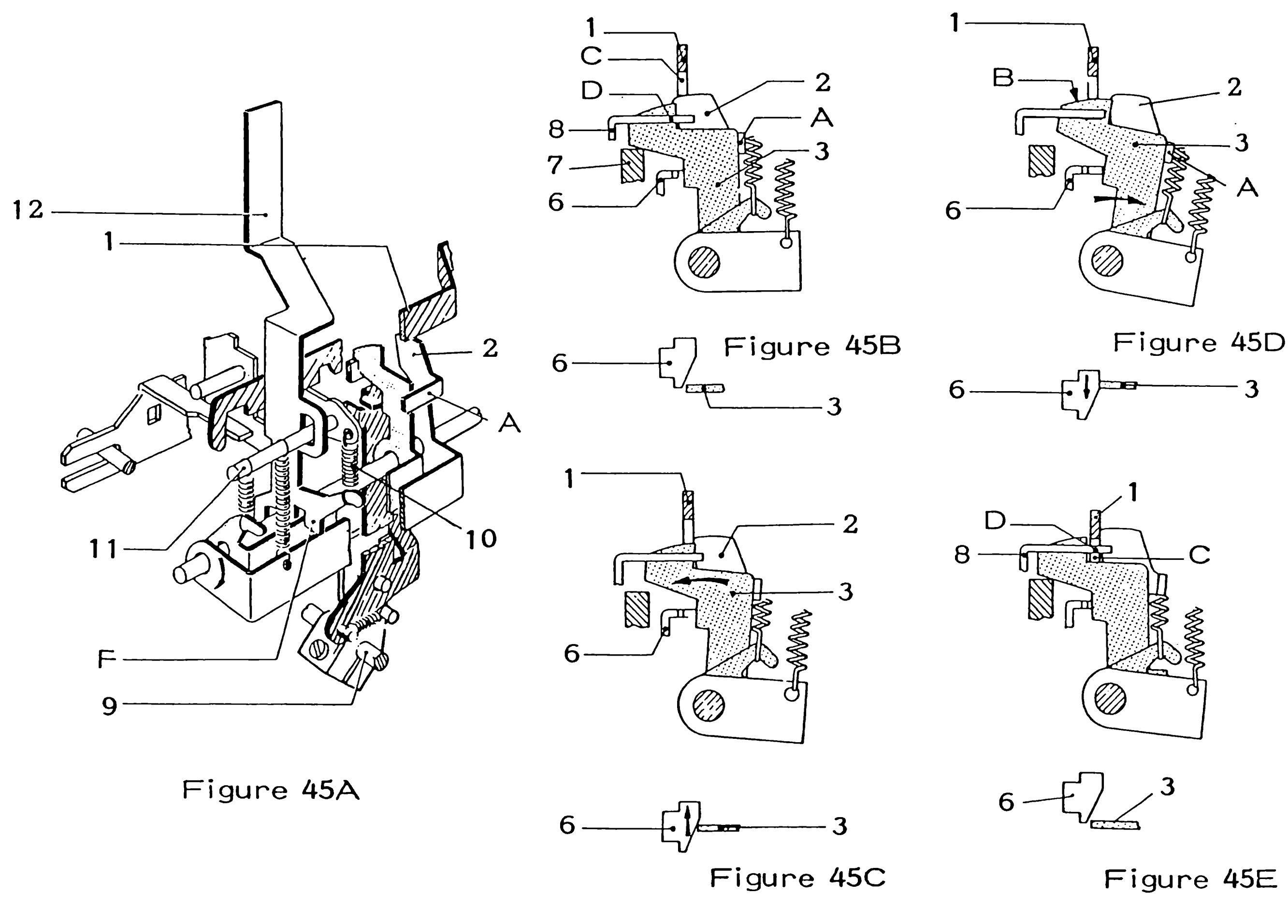


Figure 45A

Figure 45B

Figure 45C

Figure 45D

Figure 45E

Figure 45

Paper Release

Depressing Paper Release Key (1) rotates the Paper Release Shaft (4) and its associated arm. The lower extension (E) on the arm of the Shaft (4) engages the step (D) of the Paper Release Latch (5).

The extension (A) of the Paper Release Crank (2) and extension (B) of the Shaft arm (4) push against the two wings of the Paper Guide (3), causing the Guide to follow the rotation of the Shaft. This rotation stretches both Springs (m1) and moves both small knurled Rollers (7) out of contact with the Paper Feed Wheels..

The Guide and Rollers are placed back into operation position by depressing the Paper Feed Lever (8). This releases the wing (E) when the Release Latch (5) is contacted at wing (C).

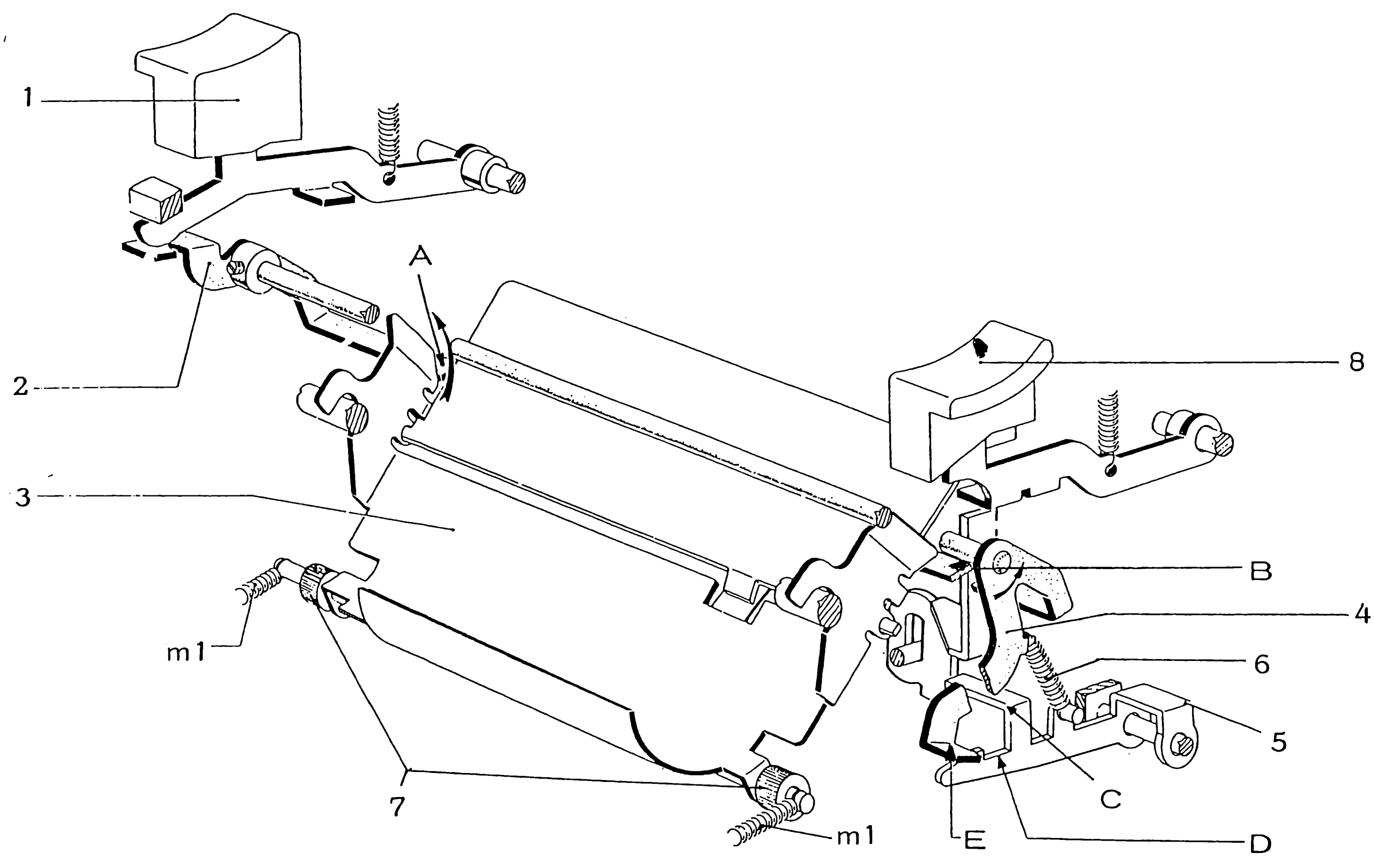


Figure 46

Paper Feed Adjustment Figure 47A

Perform the following check to determine that the Paper Feed Mechanism (including the Paper Feed Control Arm, Paper Feed Pawl and Detent Gear) is performing properly. Proper indications for this check eliminates the need for adjustment.

Check.

1. Depress the Print Solenoid Plunger and rotate the Servo Pulley. At the time that the Print Control Shaft (10) is being activated, the Bridge (7) will be rotated and will release Pawl (2), which must be seen to move toward the wing (A) of the Service Plate (1).

2. Release the Print Solenoid Plunger and continue rotating the Servo Pulley slowly. The Service Plate will travel toward the rear and then begin traveling toward the front. While traveling toward the front, the extension (B) of the Pawl (2) must drop the remaining distance to rest on the wing (A) of the Service Plate (1), as shown in Figure 47B.

3. Continue the rotation slowly until the Service Plate has reached maximum rearward travel. At this point the Pawl (2) should have dropped with its slot positioned on the wing of the Service Plate (1) as shown in Figure 47C.

4. Continue rotation and observe that as the Gear (3) rotates, it affects the rotation of the Detent Gear (5) sufficiently to allow the Roller of Detent (4) to enter the next notch.

Adjustments.

1. To adjust for the conditions required in step 3 of the check above, form the wing (A) of Service Plate (1). Recheck for proper operation.

2. To adjust for the detent action required in step 4 of the check above, loosen the screws of the Gear (3) and position it while the Detent (4) holds the Gear (5) in position. Recheck for proper operation of the mechanism.

   Note: If operation of the Paper Feed Mechanism is still not correct, continue with this procedure.

3. Remove the Printer Section from the machine by removing the four mounting screws.

4. Manually move the Carriage to the left.

5. Holding the Carriage to the left, depress the Print Solenoid Plunger and rotate the Servo Pulley until the Print Control Shaft (10) is in the active position. In this condition, position the Printer Section so that it may be viewed from the front underside.

6. Utilizing good lighting, locate the wing (C) of the Control Arm (9) which is directly above the Print Solenoid Spring. Check that the Control Arm (9) is positioned angularly so that the Paper Feed Control Bridge (8) rests against the flat portion of its angled surface. The midpoint of this surface is ideal. (Figure 47D).

7. Using the same view (the Carriage Return Spring may be removed from its roller), observe the clearance between the Paper Feed Latch (7) and Paper Feed Pawl (2). This clearance should be about 0.3mm. (See figure 47D).

8. To adjust for the conditions required in steps 6 and 7 above, proceed as follows:

   -Loosen Screw on Control Arm (9) and adjust the Control Arm angularly on the Print Control Shaft (10) to position the Bridge (8), on the straight surface of the wing (C) of the Control Arm and simultaneously adjust the Control Arm laterally to obtain the 0.3mm clearance.

   -Repeat steps 5 through 7 above to assure that all conditions are met. (It may be necessary to readjust until all requirements are satisfied).

9. Replace the Carriage Return Spring, if previously removed.

10. Return the Printer to rest and reinstall it on the machine.

11. Check the Paper Feed Functions under working conditions to assure proper operation.

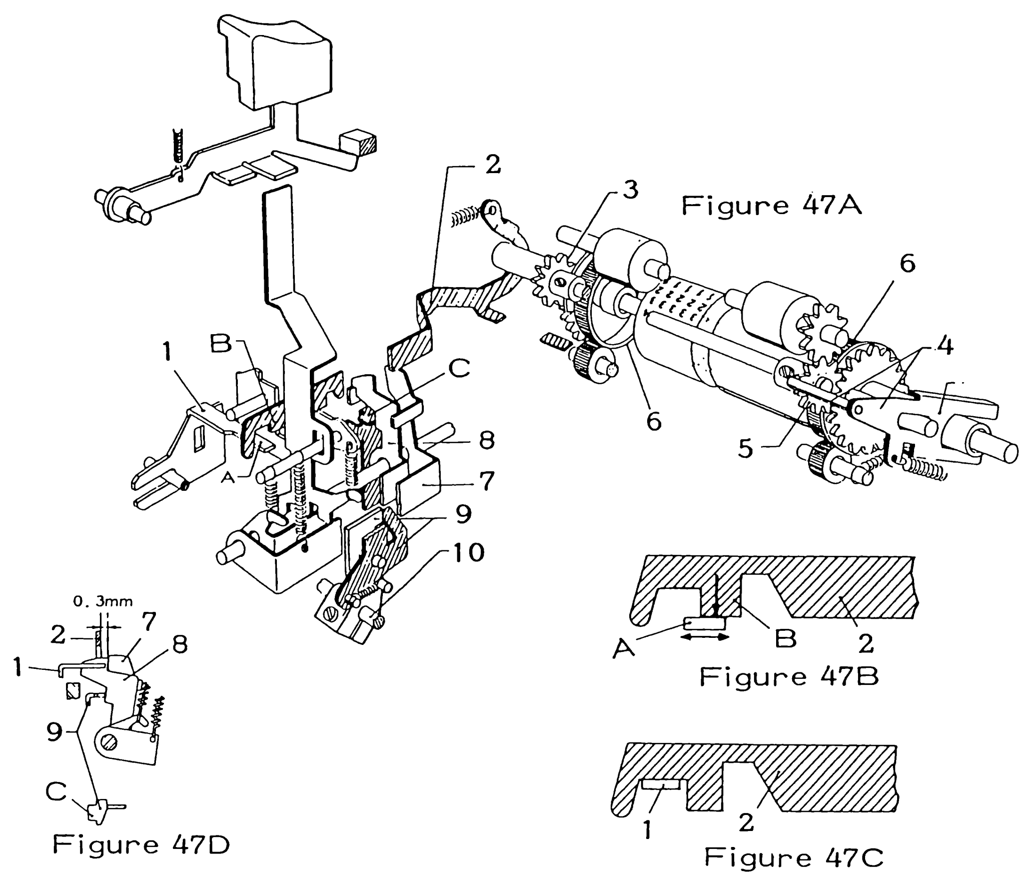


Figure 47

Paper Release Adjustments

With the Paper Release Key depressed, check that paper can be positioned freely between the Feed Rollers and the Paper Feed Wheels. When the Paper Feed Key is depressed, the Paper Release Key should become unlatched and the paper should be held securely.

If adjustment is required, proceed as follows:

- Engage extension (E) of the Paper Release Shaft (4) into Step (D) of the Latch (5). Adjust Paper Release Crank (2) so that extension (A) just touches the Paper Guide (3). Form extension (A) and (B) as required.

- Depress the Paper Release Key (1) and check to see if extension (E) has been engaged by Step (D) of the Paper Release Latch (5). If extension (E) does not move far enough to permit latching, adjust the Paper Release Crank (2). Check Spring (6) for sufficient tension.

- Check that both small Paper Pressure Rollers (7) completely clear the larger Paper Feed Wheels. Both of the Springs (m1) must exert an equal amount of pull to insure proper paper feed.

- Depress the Repeat Line Space Lever (8). Check that extension (E) of the Paper Release Shaft (4) has been released from Step (D) of the Paper Release Latch (5).

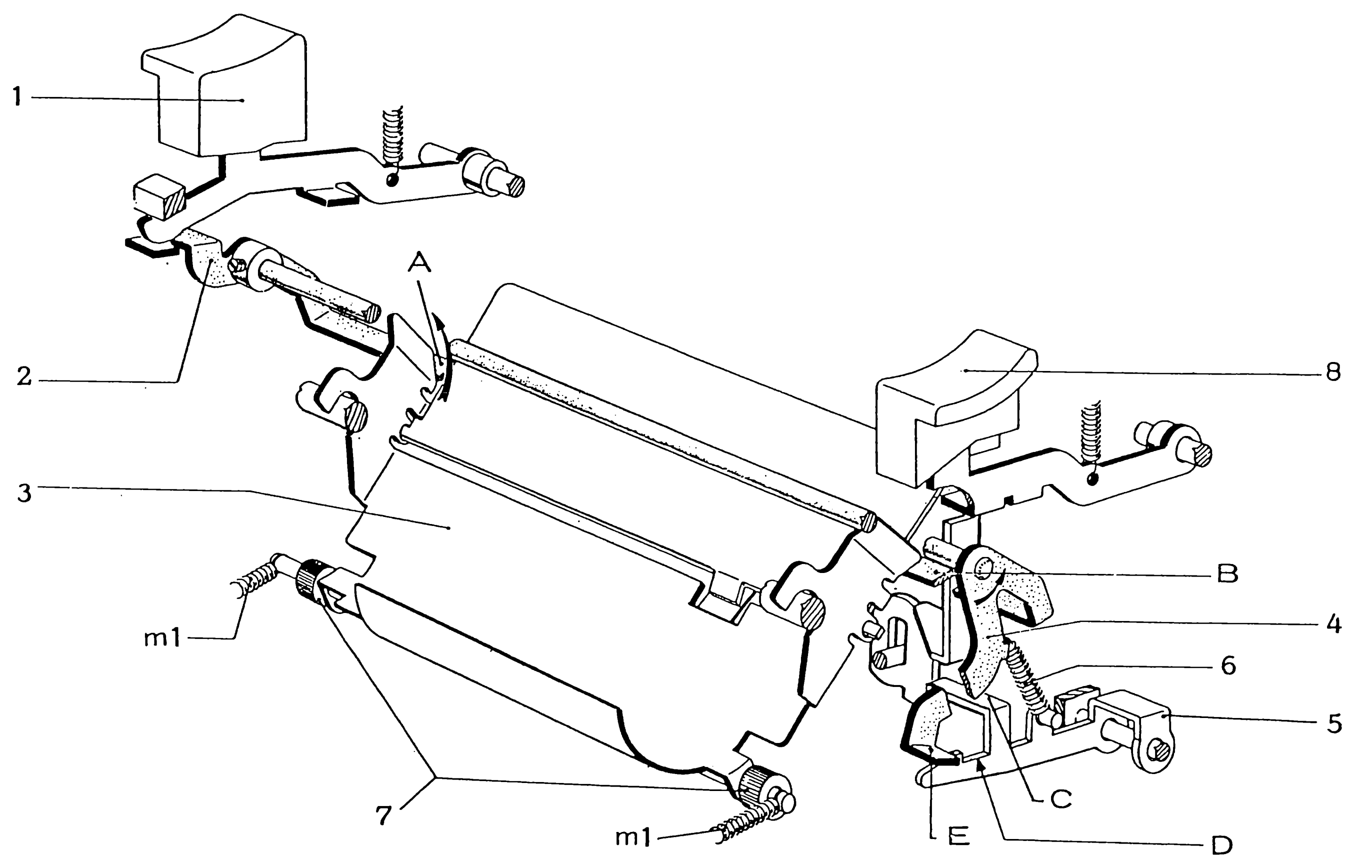


Figure 48

SECTION 5
RIBBON OPERATION UNIT

RIBBON FEED ASSEMBLY

The separate functions of the Ribbon Feed Assembly are discussed under ribbon path, ribbon feed, and ribbon reverse.

RIBBON PATH

See figure 49. Each Ribbon Spool is seated on the Ribbon Shaft (1) and held fixed to the Shaft by the pin (A). The ribbon is positioned between the Character Drum and the Print Hammer by the Ribbon Guides (4 and 8) which rest on the Studs (5 and 7). Ribbon tension is maintained by the Sensors (2 and 3) under the tension of the Spring (6).

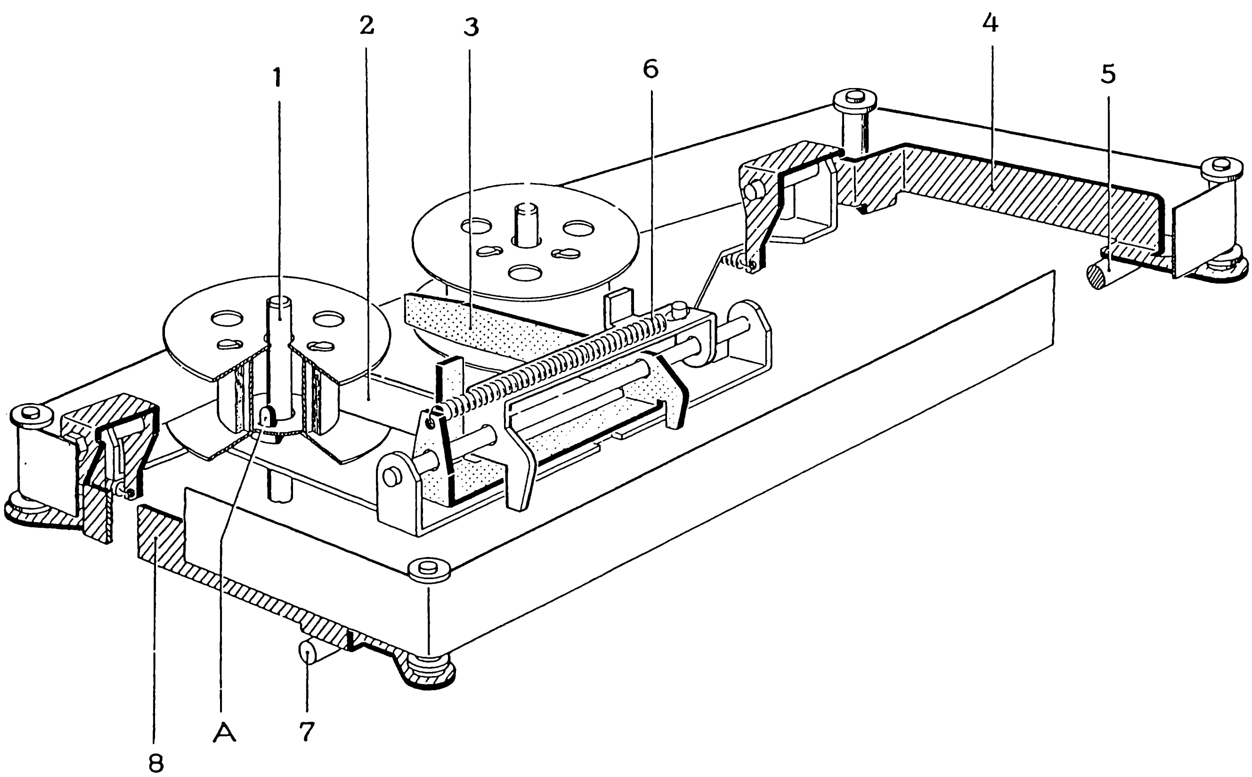


Figure 49

RIBBON FEED

Ribbon Feed is completed at the end of each printing sequence. Its main components are (see figure 50).

Ribbon Feed Control Crank (1) Presets and actuates the Drive Pawl Mechanism resulting in ribbon feed.

Ribbon Feed Pawl Mechanism (2) Rotates Ratchet Intermediate Gear (3).

Ratchet Intermediate Gear (3) Rotates Intermediate Gear (4) and Intermediate Pinion (5) which engage the Spool Pinion (6) to feed the Ribbon.

Ribbon Feed Detent (9) Prevents the counterrotation of the ribbon drive chain when ribbon feed is being preset.

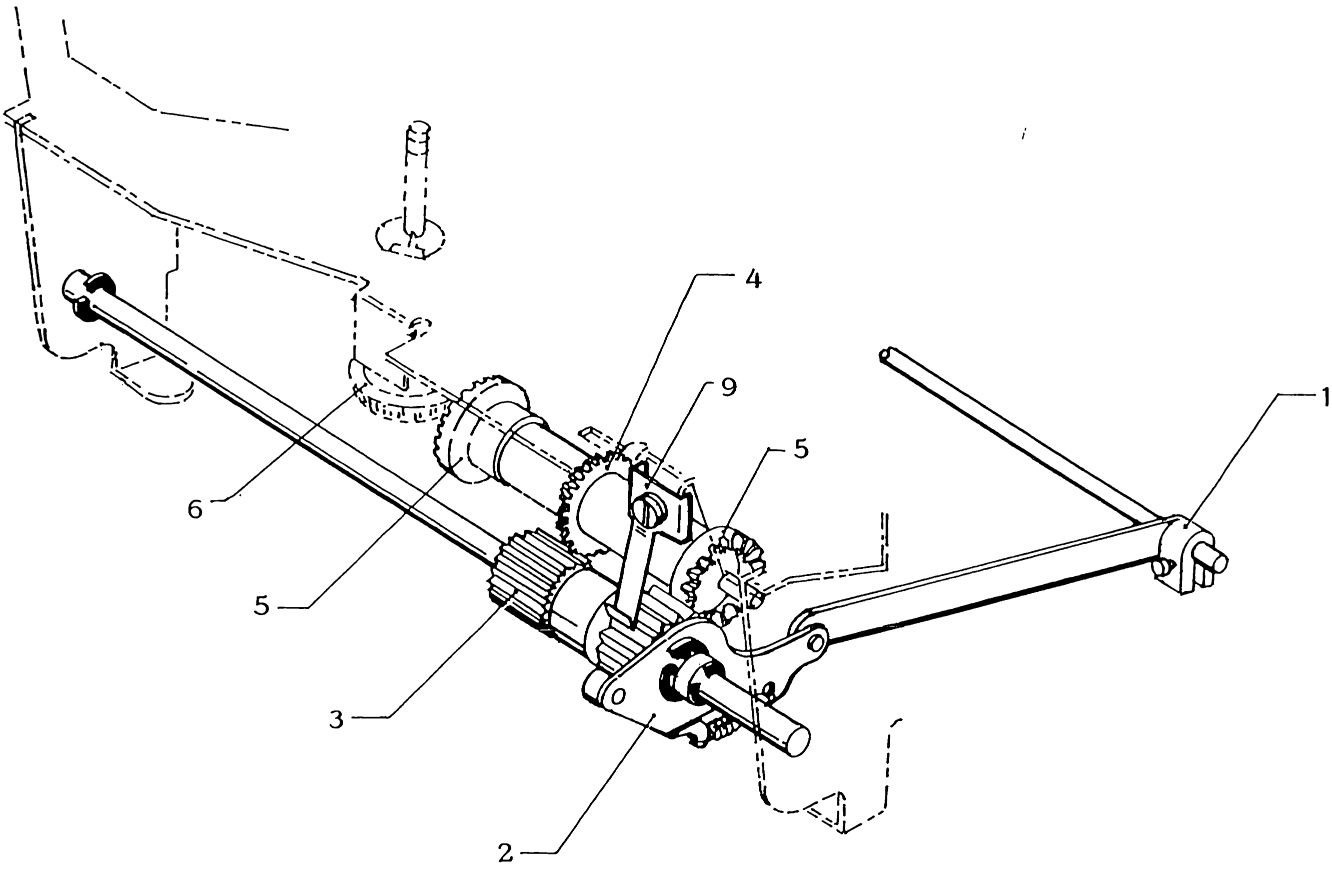


Figure 50

RIBBON REVERSE

When all the ribbon has been fed onto one spool, the ribbon-reverse mechanism is actuated so as to reverse the direction of the ribbon. This mechanism is comprised of the following main parts:

Inversion Oscillator (3) Positions the Reverse Control Plate (20) forward or rearward.

Ribbon Sensors (4 & 8) and Reverse Control Plate (20) The transfer of the ribbon from one spool to the other allows the Ribbon Sensors (4 & 8) to position the Reverse Control Plate (20) to the left or right with respect to the Inversion Oscillator.

Ribbon-Reversing Plate (7) Connected with the Intermediate Gear (15), it allows the shifting of Intermediate Pinions (13) so as to engage the left or right Spool Pinion (14).

Intermediate Pinions (13) and Intermediate Gear (15) Depending upon their lateral positions, they impart motion to the left or right Spool Pinion (14), determining the direction of ribbon feed.

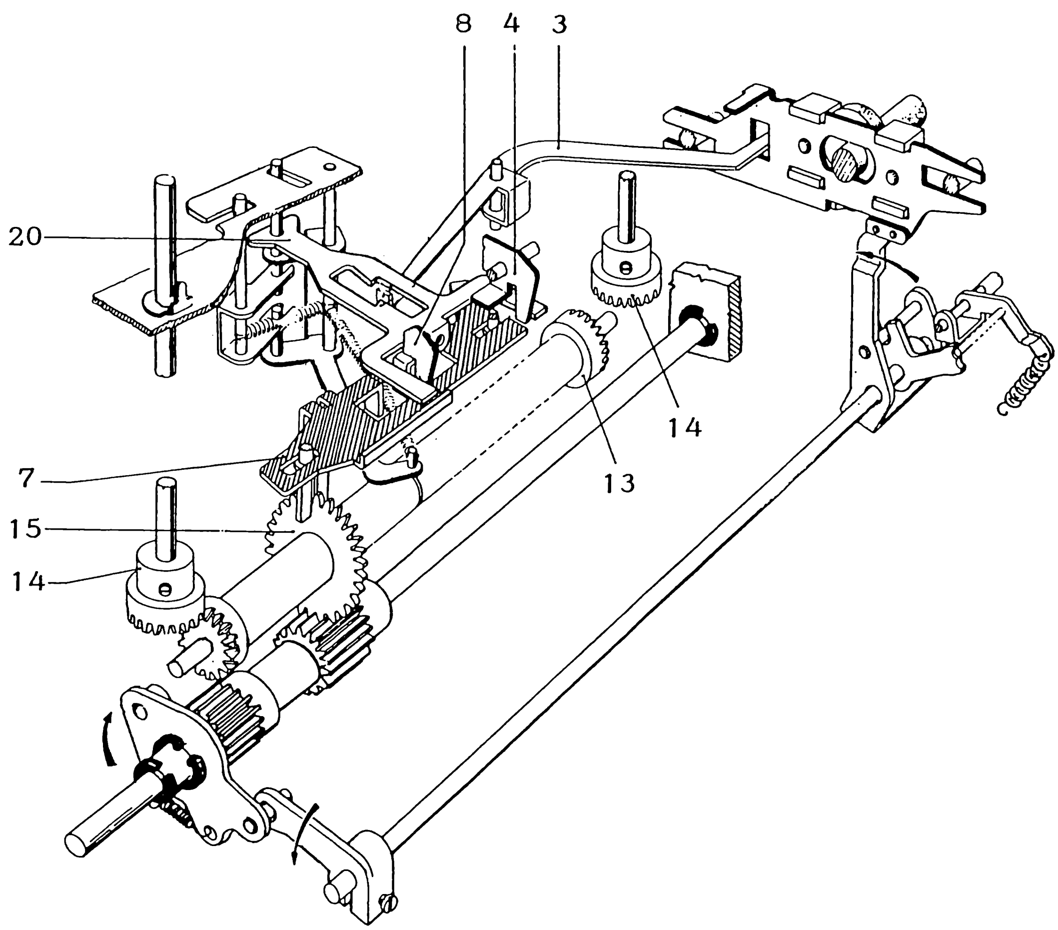


Figure 51

PARTS MOVEMENTS

Ribbon Feed Figure 52A

At the beginning of the printing sequence, the Print Control Solenoid is energized, and the Printer Control Shaft is rotated, causing:

-The Control Crank (10) to rotate in the direction of the arrow.

-The Drive Pawl Mechanism (11) to rotate in the direction of the arrow and engage over the teeth of Ratchet Intermediate Gear (6). The Ratchet Intermediate Gear (6) is held stationary by Ribbon Feed detent (5).

This sequence of parts movements has preset ribbon feed. When the printing sequence has been completed and the solenoid deenergizes, the Print Control Shaft is returned to rest, causing:

-The Control Crank (10) to rotate in the direction opposite to the arrow.

-The Drive Pawl Mechanism (11) to rotate in the direction opposite to the arrow, rotating the Ratchet Intermediate Gear (6) with which it is engaged. As the Ratchet Intermediate Gear rotates, Intermediate Gear (15), Intermediate Pinions (13), Ribbon Spool Pinions (14), and Ribbon Shafts (19) are set in motion.

-The Ribbon Spool engaged on the Ribbon Shaft to be rotated, completing the ribbon feed sequence.

Ribbon Reverse

Figure 52A indicates the condition of the ribbon mechanism when the ribbon is feeding to the left. In this condition:

-The left Intermediate Pinion (13) is engaged with the left Spool Pinion (14).

-The Ribbon Reversing Plate (7) is held to the left by Ribbon Reverse Bridge Spring (17). This condition is maintained by Detent (18).

-Reverse Control Plate (20) is limiting at the rear with Shaft (1) in the rear of slot (A) and limiting at the left under the control of Ribbon Sensors (4) and (8).

Figure 52B illustrates the position occupied by the Reverse Control Plate (20) at the initiation of leftward feeding (right spool full). The Reverse Control Plate (20) has placed step (B) in the trajectory of the Inversion Oscillator (3). The Inversion Oscillator contacting step (B) has positioned the Reverse Control Plate (20) rearward. Further movement of the Inversion Oscillator will confirm that the Reverse Control Plate is in its rearmost position.

Figure 52C illustrates the position assumed by the Reverse Control Plate (20) as the Ribbon Feeds to the left. The left Ribbon Spool fills, causing Ribbon Sensor (8) to move toward the right. Under spring tension, the Ribbon Sensor (4) is following the decreasing circumference of the right Ribbon Spool. The extension of the Ribbon Sensor is rotating the Reverse Control Plate (20) toward the right but movement of the Inversion Oscillator (3) will have no effect

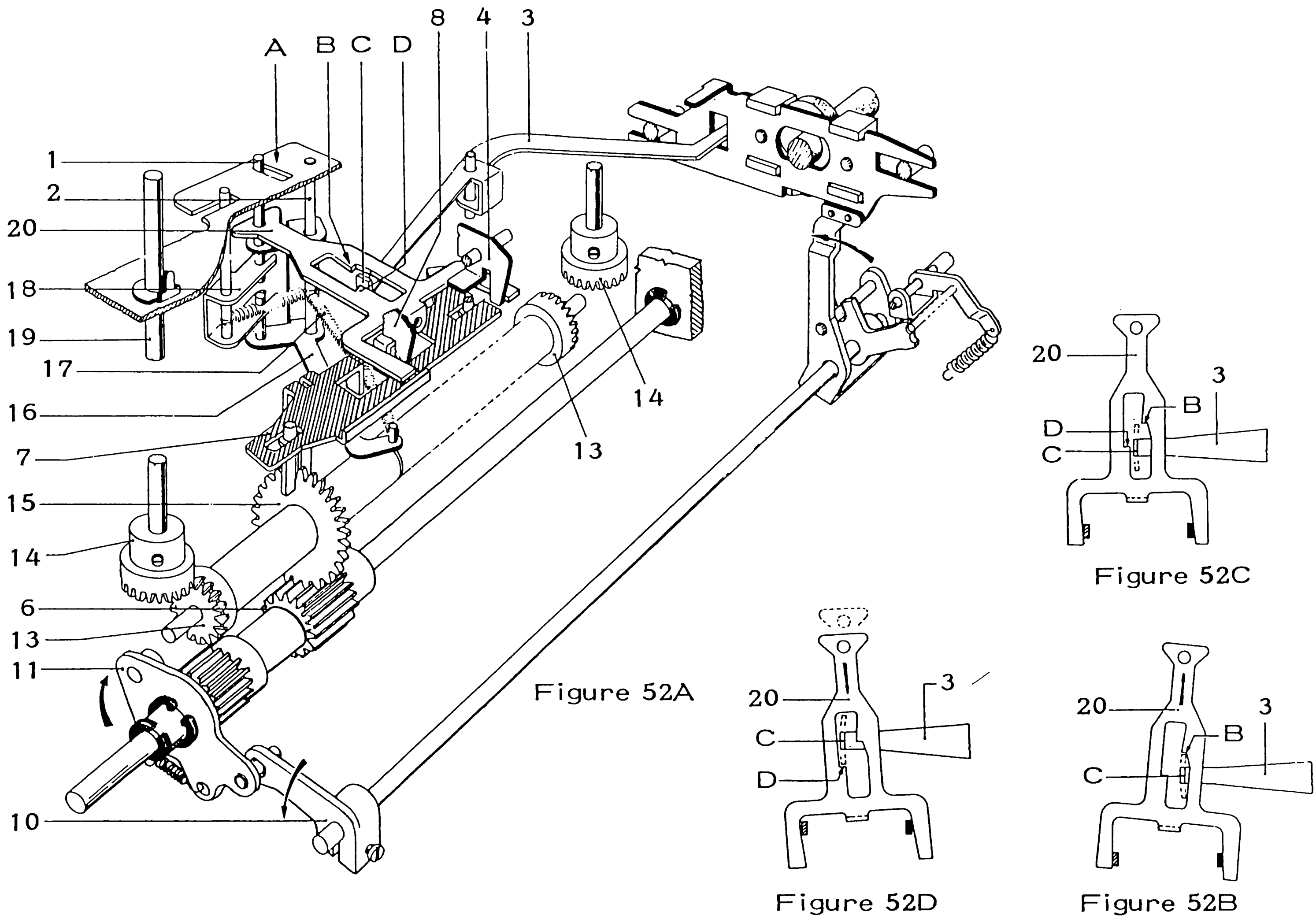

A
B C D
8
4
3
1
2
20
18
19
17
16
7
15
14
6
13
11
10
13
14
Figure 52A
20
3
B
D
C
Figure 52C
20
3
C
D
Figure 52D
20
3
B
C
Figure 52B

Figure 52

since it is idling in the central area of the slot of the Reverse Control Plate (20).

Figure 52D illustrates that Ribbon Feed has continued affecting further travel to the right of the Reverse Control Plate (20) which will result in placing the step (D) in the trajectory of the wing (C) of the Inversion Oscillator (3). When this has occurred, a forward arc of the Inversion Oscillator will cause the forward movement of the Reverse Control Plate (20) and through its Shaft (1), the rotation of the Detent (18) and Ribbon Reverse Bridge (16).

The Detent (18) acts to maintain the Reverse Control Plate (20) and Reverse Bridge (16) in the position they achieved from the action of the Oscillating Bridge (3). The Reverse Bridge pivots about Stud (2) and makes a counterclockwise rotation; its position is limited by the Shaft (1) contacting the front edge of the slot (A). The Bridge 16 has moved Spring (17) to contact the wing of the Ribbon-Reversing Plate (7), positioning it toward the right, which will cause a rightward movement of the Gear (15) and result in:

-Disengagement of the left Intermediate Pinion (13) from the left Spool Pinion (14).

-Engagement of the right Intermediate Gear with the right Spool Pinion. When the engagement of the right Intermediate Pinion with the right Pinion results in tooth-to-tooth contact, Spring (17) yields.

The ribbon will now be fed toward the right. The Reverse Control Plate (20) will start moving toward the left. When the step (B) is brought into the trajectory of the wing (C) of the Inversion Oscillator (3), the chain of movements outlined above will have been completed.

ADJUSTMENTS

With power on, observe that the ribbon is stationary. Perform an operation that will give a print-out and see if the ribbon moves, and that it stops as printing ceases.

Remove the ribbon. With power on, move both Ribbon Sensors first right and then left, watching for actuation of the Ribbon Reversing Bridges which can be seen at the rear edge of the Mounting Plate.

Check for ribbon reversal by winding up the ribbon manually. If ribbon reversal does not take place at about 20 to 30 inches from the end of the ribbon, then the tabs extending downward on the front of the Ribbon Sensors must be formed so that reversal takes place at this point.

Control Crank

With the Printer Control Shaft detented at the rest position, the arm of the Control Crank (1) should be aligned laterally with the cutout (A) of the frame. At the same time, the pin (B) of the Drive Pawl Mechanism (2) should be contacting the rear surface of the slot of Control Crank (1).

Loosen the screw and position the Control Crank (1) to satisfy the foregoing requirements.

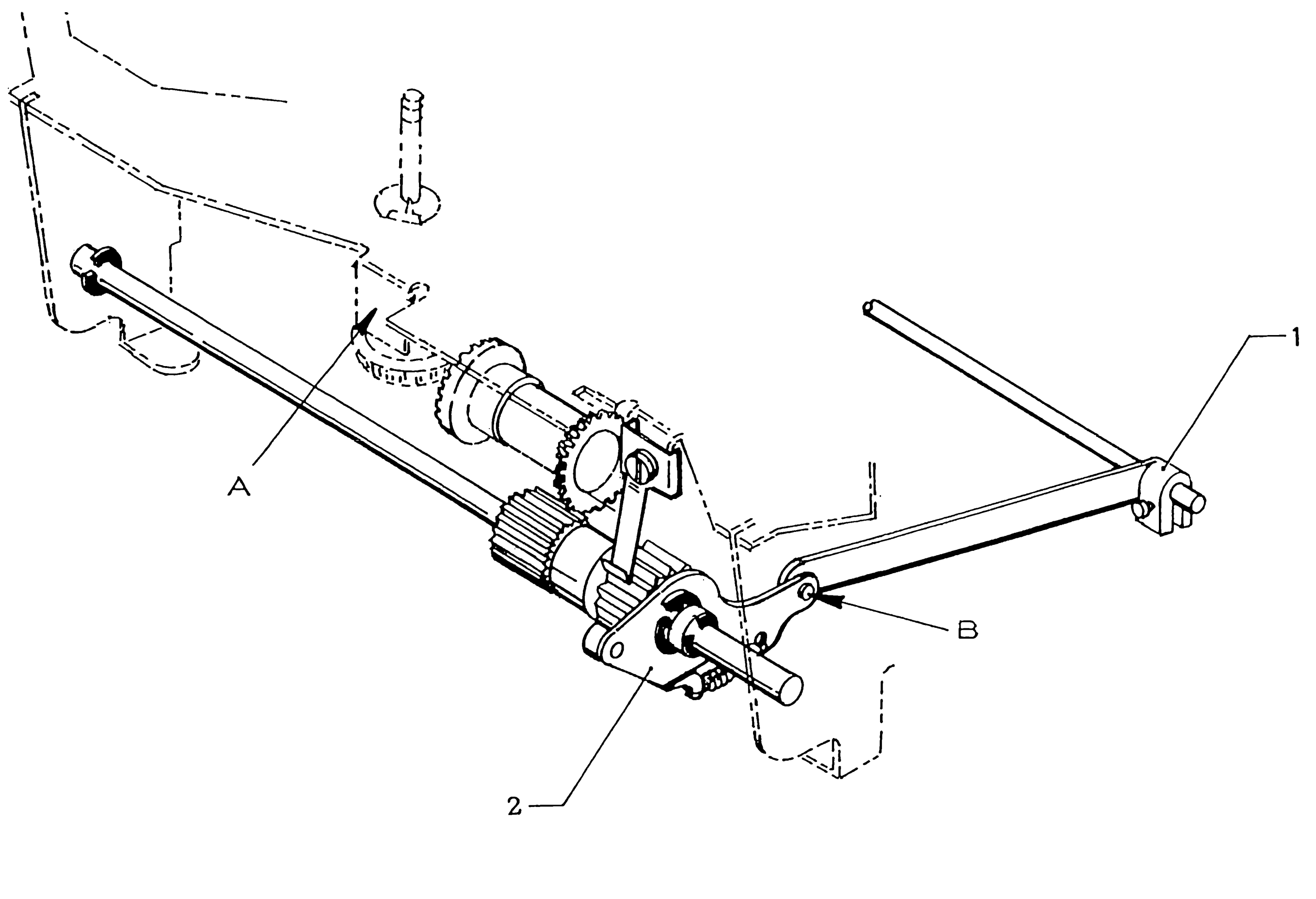


Figure 53

SECTION 6
MAGNET CARD
READ/RECOD UNIT

CARD SECTION

1. Operation: Refer to Figure 54

Inserting a Program Card into the Upper Card Chute (1) permits the constantly rotating Upper Card Roller (2) mounted on slanted Shaft "S" to propel the Card under the activating Rollers A & B. At the same time, the Card's edge advances between the Magnetic Head (3) and its Pressure Roller (4). When both Rollers have been pushed upward, the AO Microswitch is closed.

BOTH ROLLERS A & B MUST BE ACTIVATED TO KEEP AO MICROSWITCH CLOSED. For example, when Roller "B" drops off the Card's trailing edge, AO opens and the Magnetic Head can no longer put information into the machine's memory.

The reason for this arrangement is to prevent recording and reading on the first and last 4mm (0.016") of the Program Card, thereby avoiding the problems that would be created by reading the beginning and end-of-card impulses generated by the Magnetic Head.

The Upper Drive Shaft (S) is slanted downward to the left so that Cards will be driven against the right side of the Chute (1). This permits accurate placement of Card edges with respect to the Magnetic Head's gap, giving program recordings that can be used in other machines. The Magnetic Head is laterally adjustable to allow compensation to be made for any variation in the distance of the track to the Card's edge.

2. Adjustments: Refer to Figure 55

a. General: Cards should be in good condition, with no nicks in the edge or ends. If dirty, they can be cleaned with alcohol, FREON TF* or GENESOLV-D** and a soft cloth. Do not use carbon tetrachloride, laquer thinner, trichlorethylene or other unknown cleaning agents because they may soften the oxide binder, deform the backing, or both.

-The Pressure Roller Shaft (5, Fig. 54) must be smooth and clean. All corrosion must be removed with emery cloth and the Shaft polished.

-The Magnetic Head (3, Fig. 54) can be cleaned with FREON TF, GENESOLV-D or alcohol if dirty. Other solvents may leave an oily residue, which attracts dirt.

b. Magnetic Head Assembly: The Magnetic Head performs its read-write function properly only if cards move past it at a constant rate of speed and if good card-to-head contact is maintained. Make sure the card drive shafts do not bind and the head's rubber pressure roller is free to turn. Use oil sparingly and only if absolutely necessary.

*Made by DuPont
**Made by Allied Chemical

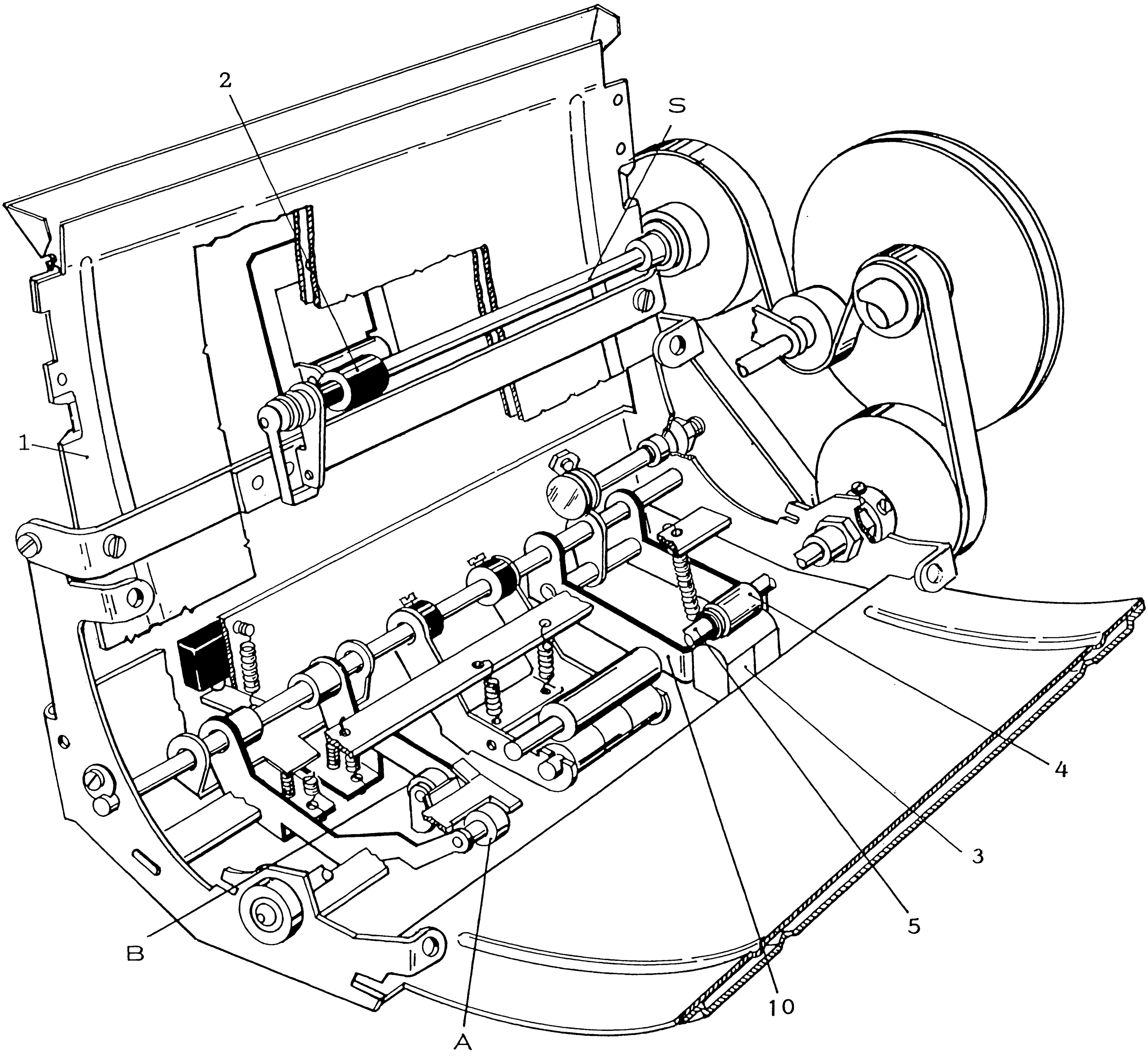


Figure 54

(c) Tracking of Magnetic Head: For an approximate tracking adjustment, turn the lateral aligning screw so that the white line in the center of the head is 9/16" away from the inside edge of the main support bracket. Finer adjustment must be made to maintain card compatibility among a number of machines at one installation.

(d) AO Control Bridges: Loosen and back off the two locknuts on the Right and Left microswitch Control Bridge (6, 7, Fig. 55), until they are clear of their seats. Unhook the Spring (D) at the post to relieve pressure on the Control Bridges.

(e) Basic Settings of Rollers: Advance Set Screws F & H (Fig. 55) until the center lines of Rollers A & B are exactly 1/16" away from the surface of the Guide (9 Fig. 56).

(f) Setting of Microswitch Activator Bridge: Refer to Fig. 55. Reattach the spring (D) to its post. Insert a card under Roller B. Hold down Roller A to prevent if from rising during the adjustment, then turn Screw "F" clockwise until the arm of the Bridge (8) is set to a minimum clearance with respect to button "E" of the AO Microswitch. Without disturbing the setting, tighten the locknut.
Advance the card to lift only Roller A. Repeat the previously used adjustment on Screw "H", tighten the locknut, and test the mechanism as outlined in section 3A.

(g) AO Microswitch Adjustments: If reliable operation of the AO Microswitch is not obtained after completing the foregoing adjustments, investigation of the AO microswitch spring characteristic is required, as follows:

If AO does not close after both Rollers have been raised, replace the spring "D" with a new spring and check operation using section 3a. If AO still does not close, replace the microswitch, testing according to section 3a.

3- Inspection:

When difficulty is encountered with the reading or writing of program information, the most recurrent causes are:

-Improper activation of the AO Microswitch
-Card speed changing abruptly
-Insufficient Card Pressure against the Magnetic Head
-Program partially erased from card
-Imcompatible recording
-Defective Electronic Computing Unit

The following will be of help in identifying and locating the source of difficulty.

(a) AO Microswitch Assembly: Turn the machine on and touch the "Reset" Key. Insert program card "Y". If the red light is activated, depress the "Print Program" switch then the Print (◊) Key repeatedly until the program prints out. If the printout bears no resemblance to the actual program AND the number of instructions printed is less than 120, delayed closure of AO is

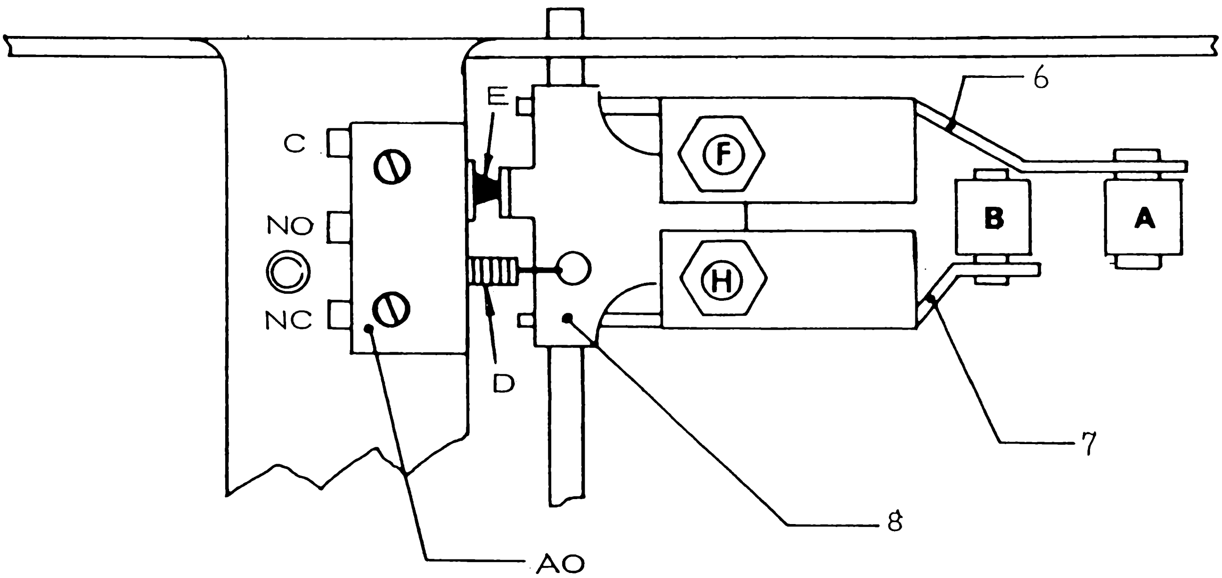
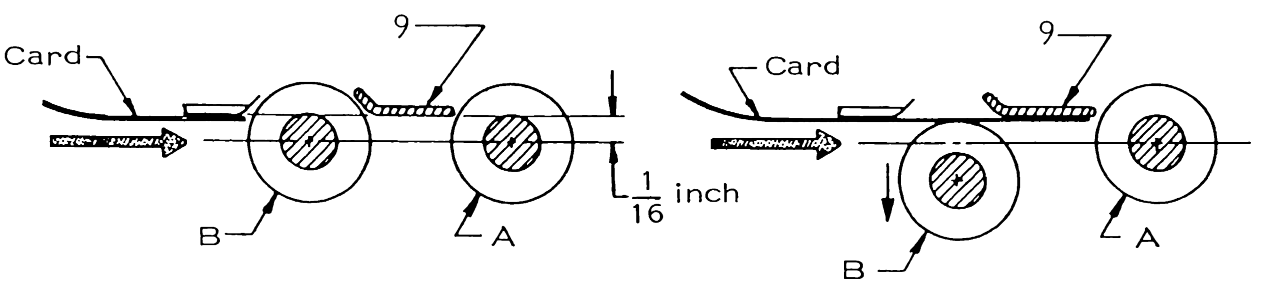


Figure 55



Basic Setting of Rollers: Card about to Activate Second Roller

First Roller Activated: Card about to Activate Second Roller

Figure 56

Any evidence that the Magnetic Head Mounting Bracket, (10; Fig. 54) enjoys less than complete freedom of movement is an indication that burrs or warps are present.

- Raise the Magnetic Head by disconnecting its hold-down spring.

Using a "Magic Marker" or felt-tipped marking pen, coat the face of the Head and reconnect the spring. Lower the keyboard, replace the belt, start the machine and run a card through the chute. Turn the machine off, raise the keyboard and the magnetic head. The clear stripe running across the head must be of uniform width, indicating even card pressure on the head, and must be across the center of the head as shown in Figure 57. See attached copy.

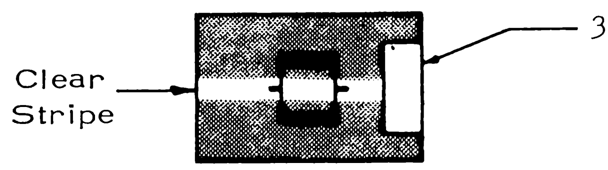


Figure 57

(d) Magnetic Head Continuity Check: Set the ohmmeter as described in section 3b. Conduct the following check with the third Electronic Computing Unit connector from the left (connector block EC) attached to the Electronic Computing Unit.

- Touch the contact of wire #20 (blue) with one probe, place the other probe on wire #18 (red). A reading of about 5 ohms should be obtained. Follow the same procedure between wire #20 and wire #19 (white) for a similar reading. If either zero (shorted) or infinite (open) readings are obtained, the head is defective and should be replaced. Wire contact #17 is connected to the casing through the Electronic Computing Unit and should normally yield a zero ohms reading on the meter.

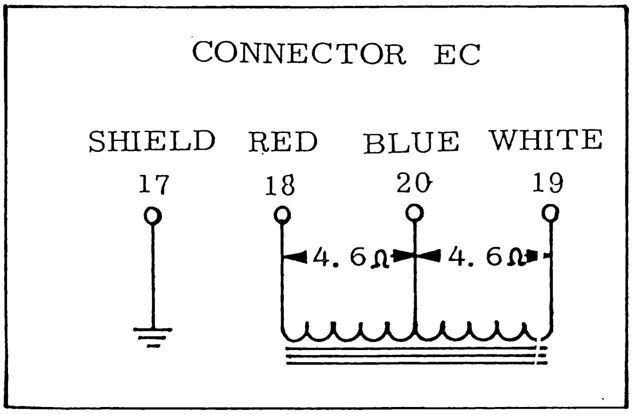


Figure 58

the cause. The following procedure will be helpful in determining the nature of the malfunction.

-Raise the keyboard and lock into position. Manually raise Roller "B" (Figure 55) about the SAME AMOUNT as a card passing under it would. It is important not to raise the Rollers further, since false actuation of microswitch AO can easily occur due to Control Bridge pressure against the Activator Bridge (8). While holding up Roller "B", raise Roller "A" and hold. Observe that AO is closing while "A" is being raised. Release Roller "B". The AO switch must deactivate while "B" comes down.

-Insert a card and advance it manually, checking that the card does not "pick" or jam against anything in its path. Observe the action of the AO microswitch for proper operation as described above. Repeat this procedure several times. If AO microswitch is not activated reliably, unhook the three springs of the assembly and see that the Bridge (8) and the Control Arms (6 and 7) are free to move individually. Each part should be able to drop of its own weight when lifted up and released.

-Attach the spring (D) to its post. Pull the Bridge arm (8) away from the microswitch so that the button (E) comes out completely, then very gently allow the Bridge arm to bear against the button (E) again. AO microswitch MUST click shut. If the Spring (D) is in good condition and AO microswitch does not close even after you have gradually released the Bridge (8) completely, the microswitch must be replaced with a unit having a "softer" action.

(b) AO Microswitch: Continuity Check: WARNING: All Ohmmeter readings must be made with power OFF and the power cord disconnected from the machine.

-Place the meter function/range selector in the "ohms x 1" position. Calibrate by touching the probes together and adjusting the needle to zero on the "ohms" scale by means of the knurled knob on the meter's left side.

-Looking down at the AO Microswitch from the front, place one meter probe against the common (C) terminal, the other to the normally open (NO) terminal as shown on Figure 56. The meter needle should not deflect until AO is activated; then a reading of zero ohms should be obtained.

-Place the probes against the two outer terminals. An immediate reading of zero ohms is normal. Activating the AO microswitch will cause the meter to indicate an "open", or infinite resistance.

(c) Magnetic Head Assembly: The head assembly bears against a rubber pressure roller. <u>This roller must be free to turn at all times.</u> Whenever a scheduled inspection is performed, this point must be checked.

SECTION 7
ELECTRICAL WIRING

A. <u>Input Power Wiring and Power Switch</u>

1. Operation: Refer to Figure 60

The two major systems which require 117 vilts ± 10% of alternating current (A. C.) for proper operation are:

-The Motor
-The Power Supply

(a) Line power to both systems is controlled by means of the ON-OFF Microswitch (S). Note that this does not prevent the continuing operation of one system if the other should fail. For this reason, a separate fuse and thermal circuit breaker are employed to protect the systems.

The single-phase Induction Motor is of the capacitor start type which uses a permanently connected start winding. Fuse F1 supplies overload and short circuit protection while passing Motor current. The Motor Start Capacitor, in conjunction with the Start Winding, provides the rotating magnetic field needed to generate sufficient starting torque. This circuit does not contribute any shaft power once the Motor is up to speed. Both the run and the start circuits are connected to the ON-OFF Switch.

The direct current required to operate the computer (+20 V. D. C.) is produced in the following manner:

Line power passes through the Thermal Switch (T) which is physically located on the Power Transistor Mounting Flange. The Thermal Switch is parallelled by a 300 M. A. fuse which will carry the load in the event that vibration opens the Thermal Switch momentarily. From this protective circuit, power is fed through the Filter, the Power Supply transformer primary windings, back through the filter and the ON-OFF Switch.

The stepped-down A. C. generated by the Power Supply transformer is taken from the transformer secondary windings and then rectified into direct current (D. C.), filtered, fused, regulated and then distributed from the Power Supply circuit board on which the Power Supply Fuse (F3) is mounted, as shown below in Figure 59.

(b) The Power ON-OFF Switch consists of a Microswitch mounted to an actuating mechanism as shown in Figure 60.

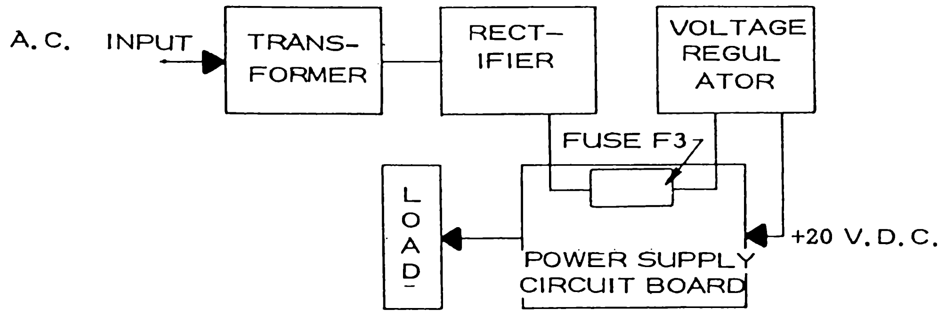


Figure 59

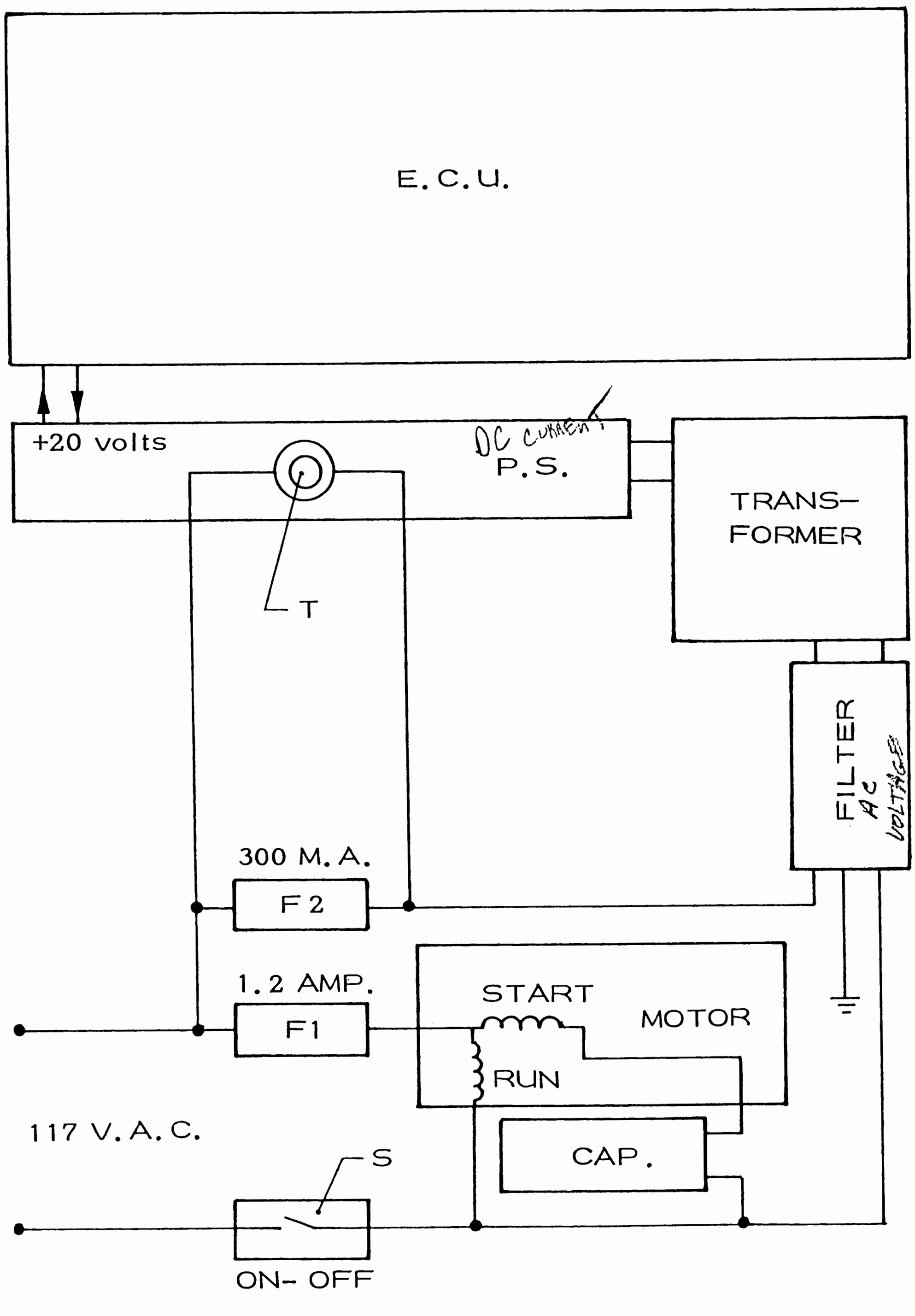

E.C.U.
+20 volts
DC CURRENT
P.S.
TRANS-
FORMER
T
FILTER
AC VOLTAGE
300 M.A.
F 2
1.2 AMP.
F1
START
MOTOR
RUN
117 V.A.C.
CAP.
S
ON- OFF

Figure 60

Switching on the Motor Unit - Main Switch 61A

As we have already noted each time the ON/OFF button is depressed the main switch is alternately closed or opened, and the electrical circuit is supplied with power or cut off accordingly. Independently of whether the switch is on or off, the button will be in the "up" position. Whether the machine is switched on or off will depend on the position of the Slider 1:

- If the Slider is in the raised position (figure 61B) the switch is off (the points G and H are out of contact.)
- With the Slider held down by the Hook 2 (figure 61C), the switch is "on" (the points G and H are closed).

The machine is switched on by depressing the Slider 1 (figure 61A) by means of pushbutton P. Stud B pushes down on Hook 2, causing the Hook to be ramped to the left until extension E passes Stud B. Hook 2 now snaps to the right, trapping Stud B as shown in Figure 61C. Slider 1 is held in its depressed position and the microswitch button 3 remains pushed in.

The machine is switched off by releasing Slider 1 from Hook 2. This is accomplished by depressing pushbutton P again, allowing Hook 2 to complete its return to the right. Stud B is positioned under ramp C by this movement of the Hook 2. As Button P is released, Stud B passes under Hook 2, raising the hook away from its normally flat resting position against the Slider 1. When the Slider 1 has completed its travel, the switch mechanism will have been restored to the configuration seen in figures 61A and 61B.

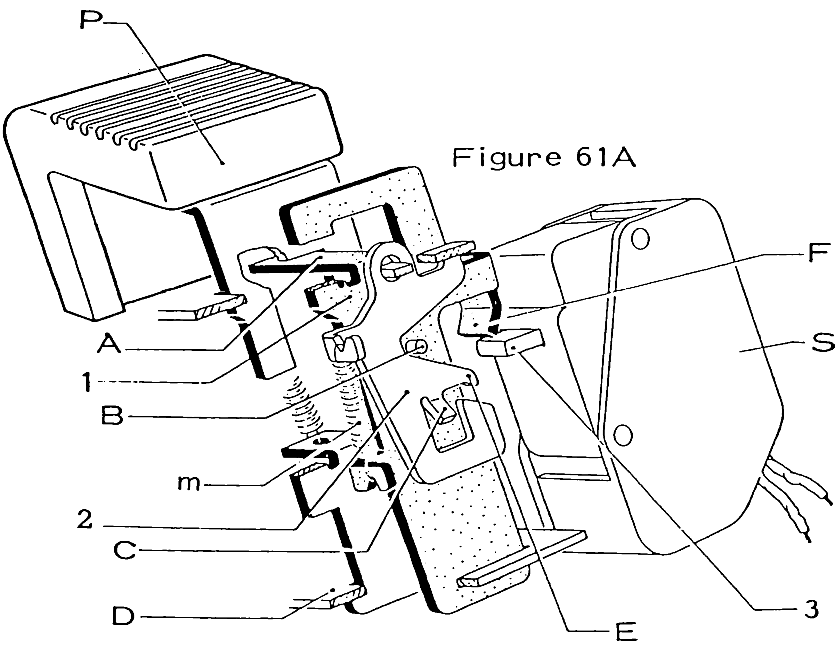


Figure 61A

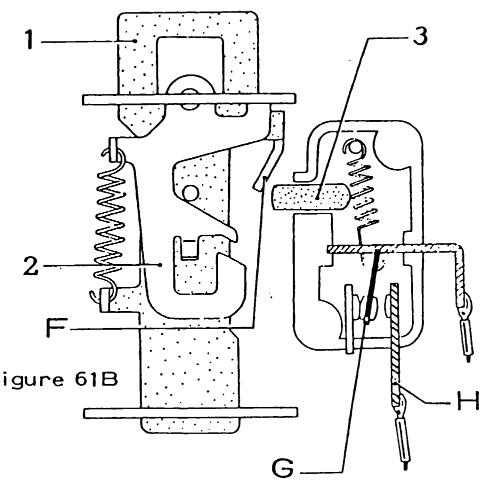


Figure 61B

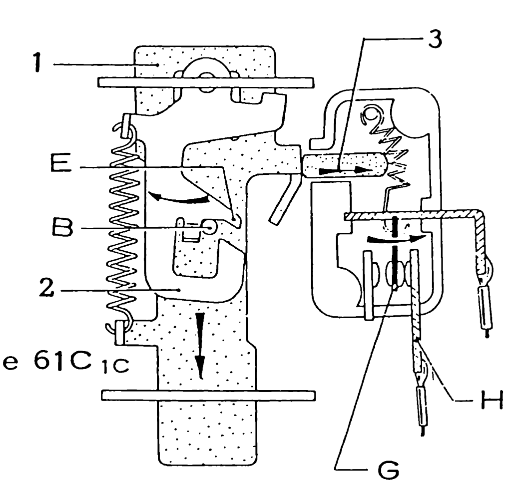


Figure 61C

Figure 61

ADJUSTMENTS

Figure 62

To adjust the main switch

Each time the main switch is depressed the Slider (1) must cause the Switch (S) to open or close alternately, by means of the inclined section F.
To do this it is essential that:

- when the Slider (1) is in the rest position the incline F should not touch the button (3) of the switch
- when the Slider (1) is in the operational position, the inclined portion F has moved the button (3) of the main switch just beyond the point at which it closes.

The necessary adjustments are made by setting the Switch (S) correctly in relation to the slots in the Guide Support.

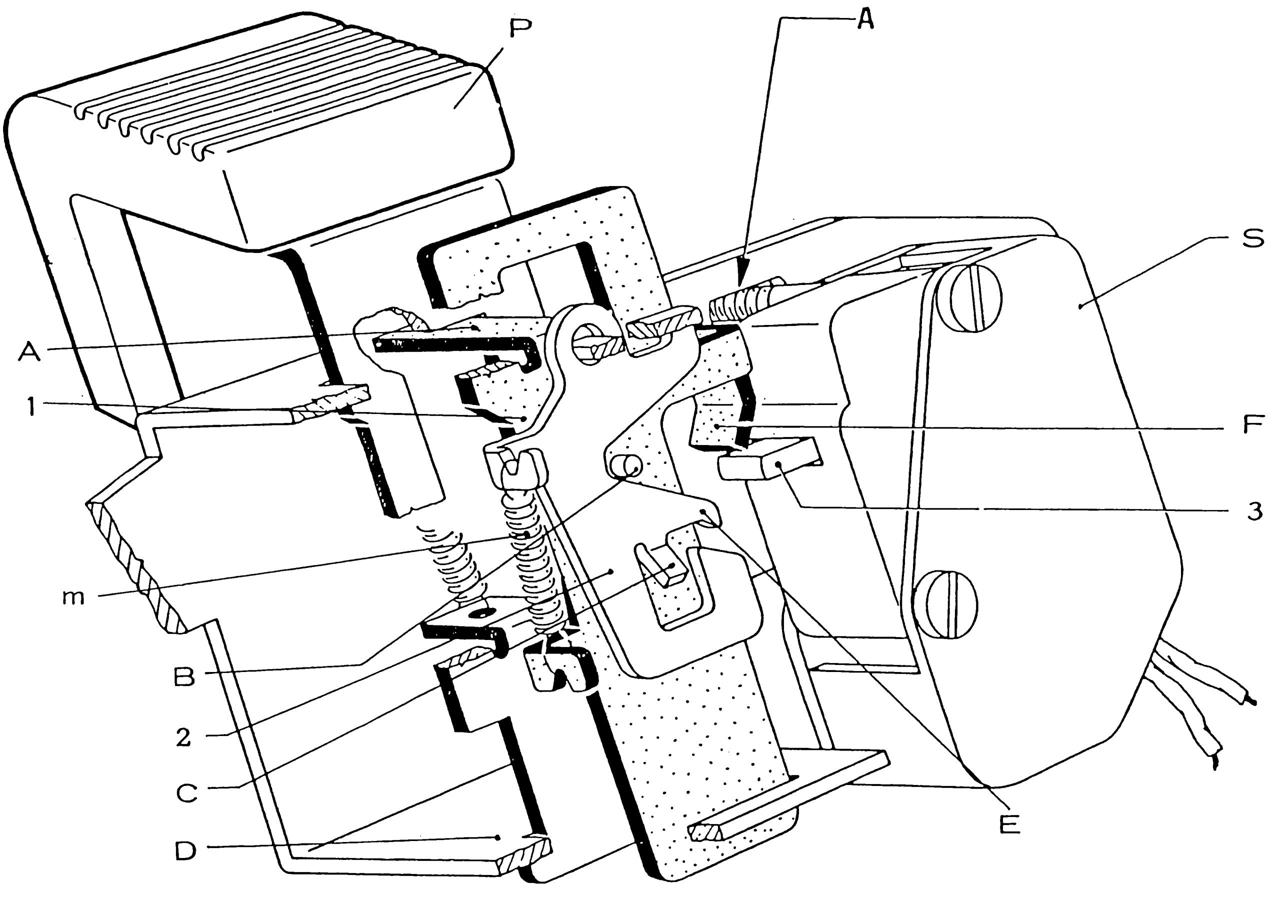


Figure 62

B. Interface Wiring & Fire Hammer Board Figure 63

1 -Operation:

The function of this part of the machine's structure is to act as the control center within the D. C. power distribution network. This network translates mechanical motion into electrical signals and vice versa. The Fire Hammer Board functions much like a switch in a power station, in that a small control current is able to switch a much larger current on or off. Other components in the circuitry act as voltage reducers or store electrical energy.

Since the Fire Hammer Board and the associated wiring is closely related and interdependent, the entire group of functions between the Keyboard-Encoder and the Electronic Computing Unit is called the Interface.

The following diagrams will show what parts of the Interface are utilized for each listed function:

-D. C. Power Distribution
-Print Solenoid
-Computing Lock Solenoid
-Timing Wheel Pickup Coil
-Print Hammer Electromagnet
-AO Microswitch
-AW Microswitch
-AP - AZ Switch Group
-Keyboard Microswitches

(a) D. C. Power Distribution:

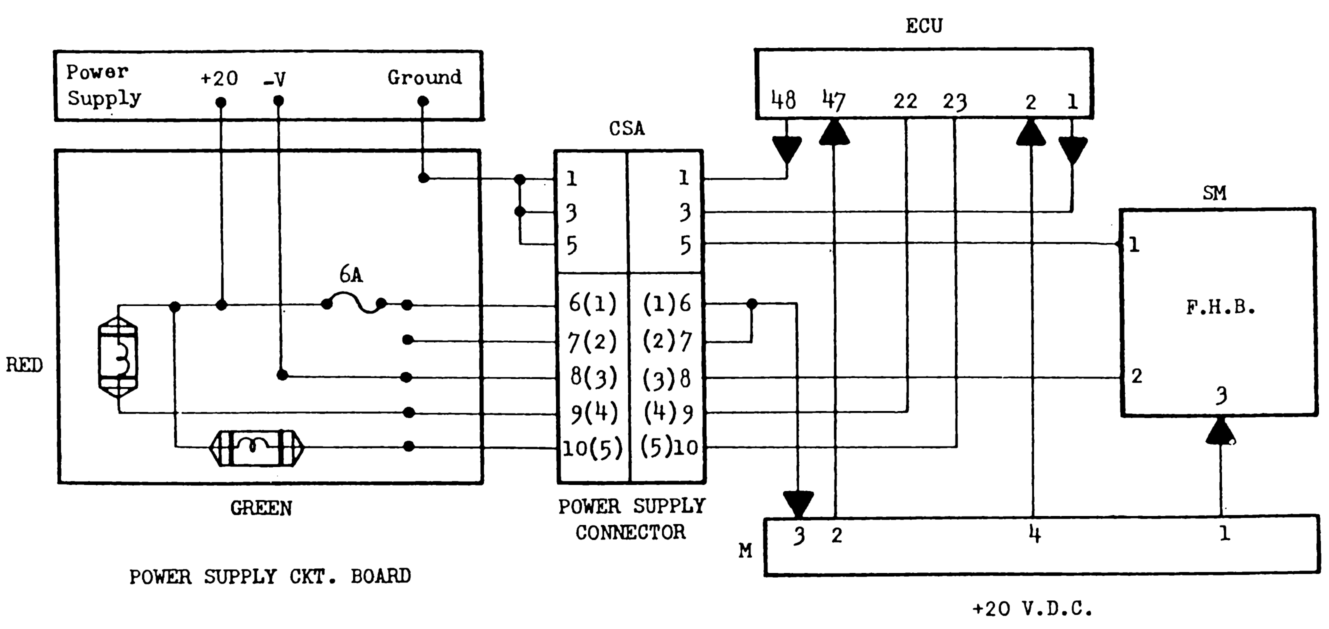


Figure 63

The regulated direct current (+20VDC) and the negative unregulated direct current (-V) put out by the Power Supply is distributed from the green Power Supply Circuit Board through the attached Connector Set (CSA).

Note that only the +20 volt Distribution Block (M) receives current directly from the Connector (CSA) and that negative voltage goes only to the Fire Hammer Board. All grounding connections are returned to the Power Supply through the Connector (CSA), thus avoiding the use of the chassis as a common ground.

(b) Print Solenoid:

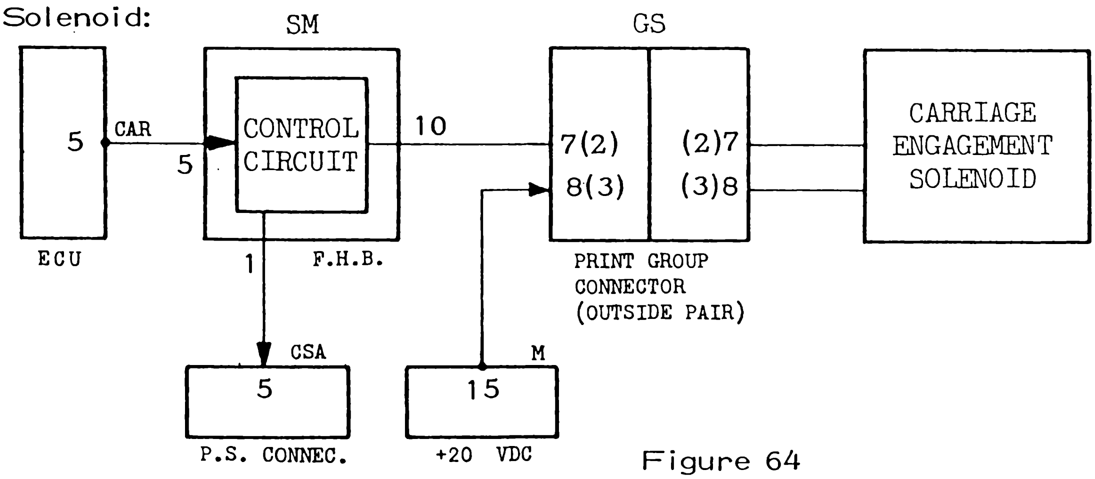


Figure 64

The Electronic Computing Unit Carriage Signal (CAR) turns on a transistor in the Fire Hammer Board control circuit. A current path is established by this means and the Solenoid energizes, causing the print cycle to begin.

(c) Computing Lock Solenoid:

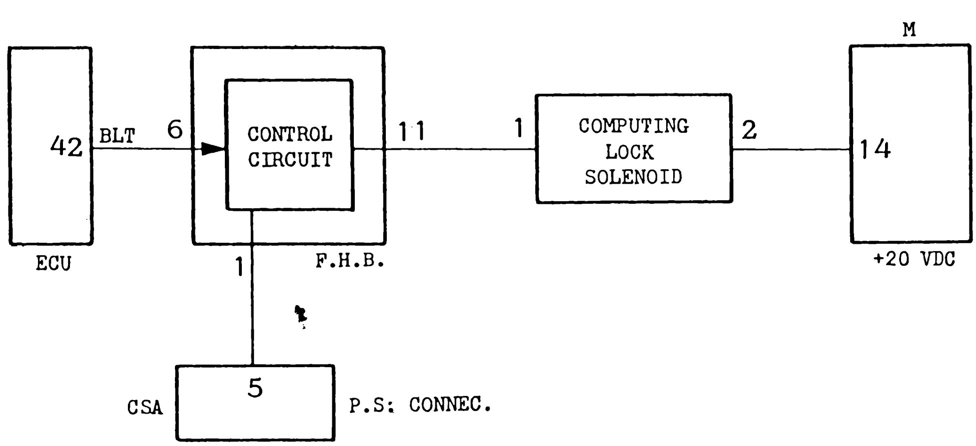


Figure 65

To prevent Keyboard entries from being made when the machine is not ready to accept one, the Electronic Computing Unit signal (BLT) turns off a transistor in the proper Fire Hammer Board control circuit. The current through the Computing Lock Solenoid is interruped, thus locking the Keyboard Key.

(d) Timing Wheel Pickup Coil:

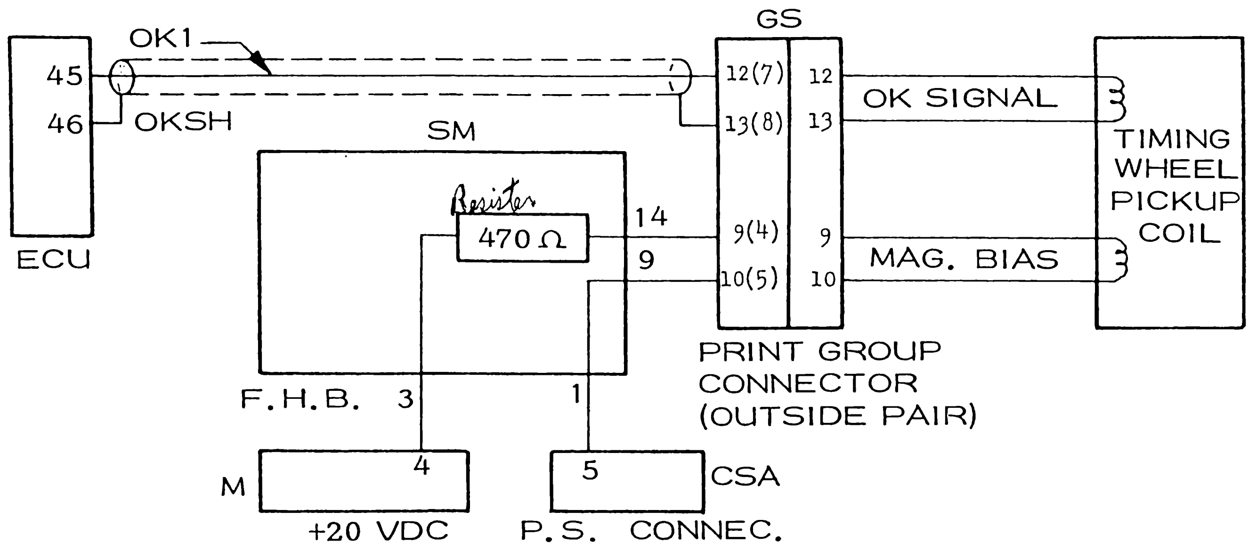
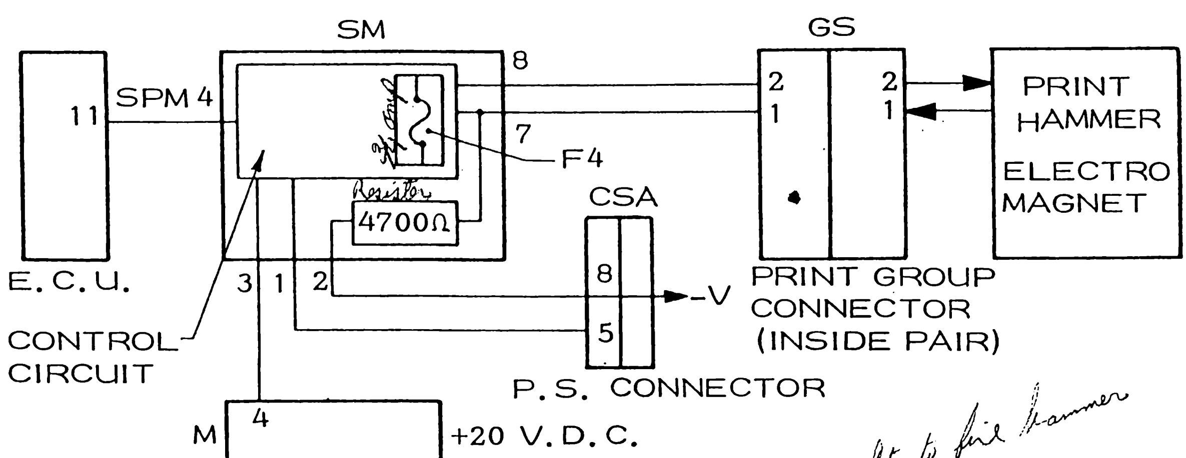


Figure 66

In order to produce timing signals (OK 1) so that the Electronic Computing Unit can recognize Character Drum positions, one coil of the Timing Wheel Pickup is energized to provide a magnetic field. This field, or bias, is varied by the passing iron slugs. The second coil senses these magnetic variations and generates the required OK pulses. These pulses are sent to the Electronic Computing Unit through a shielded cable.

(e) Print Hammer Electromagnet:



32 volts to fire hammer

Figure 67

+20 -32
-12

After the carriage has been engaged, the OK pulses are counted by the Electronic Computing Unit and the Print Hammer fired when the correct character is reached on the Character Drum. A large capacitor stores the sum of the negative and positive voltages (35 to 45 volts) applied to it. This stored energy is discharged through the Print Hammer Electromagnet when the appropriate Fire Hammer Board Control Circuit receives an SPM signal from the Electronic Computing Unit. The fuse (F 4,750 M.A.) provides overcurrent protection for the Large Fire Hammer Board transistor.

(f) AO Microswitch:

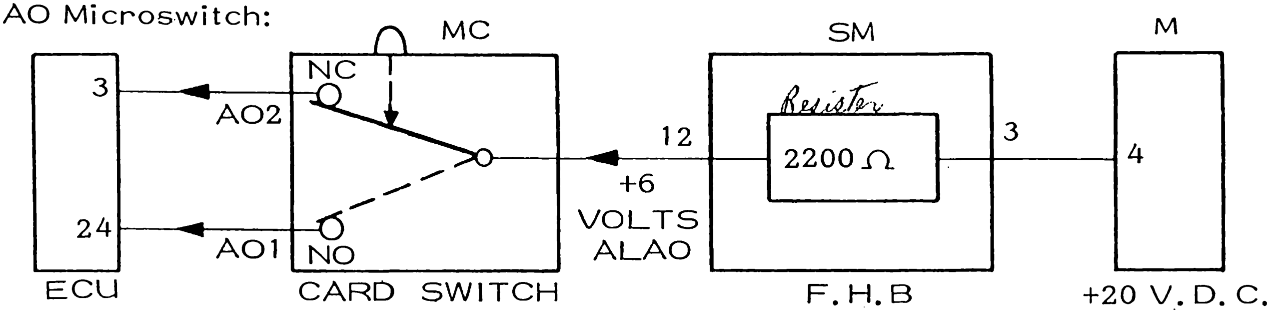


Figure 68

The Card Switch (AO Microswitch) receives a reduced voltage from the Fire Hammer Board so that its signals, AO_1 and AO_2, can be directly utilized by the Electronic Computing Unit.

Signal AO_1 is generated by the passage of a magnetic card under the rollers, enabling the Electronic Computing Unit to read or record bits on the card.

(g) AW Microswitch:

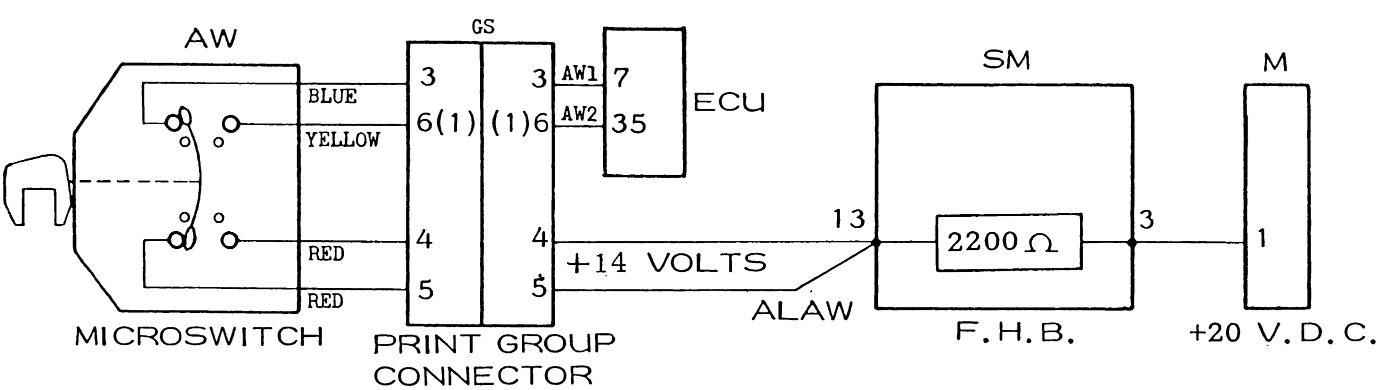


Figure 69

The AW Microswitch is used to enable the Electronic Computing Unit to know when the Print Carriage is away from its home position. Signal AW allows the Electronic Computing Unit to begin counting the OK pulses generated by the timing wheel and coils. AW assumes the illustrated position whenever printing is taking place.

(h) AP, AZ Switch Group:

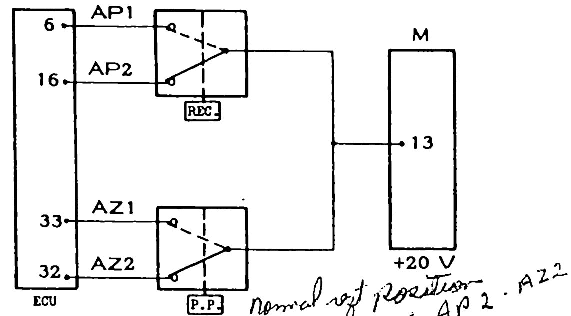


Figure 70

Both the Record Program Switch (AP) and the Print Program Switch (AZ) operate in exactly the same manner: The +20 volt current is simply switched from one Electronic Computing Unit input to the other in order to produce the desired functions. The Switches are shown in their rest (out) positions.

(i) Keyboard Microswitches:

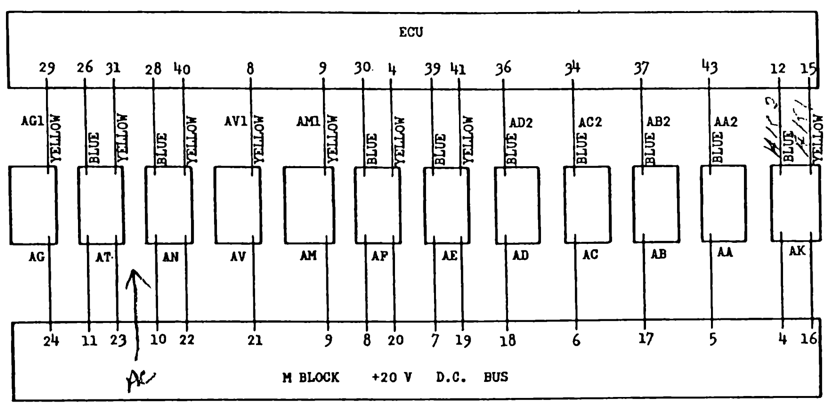


Figure 71

Figure 72 shows the twelve Keyboard microswitches in the same order that can be found on each machine above serial number 1401588.

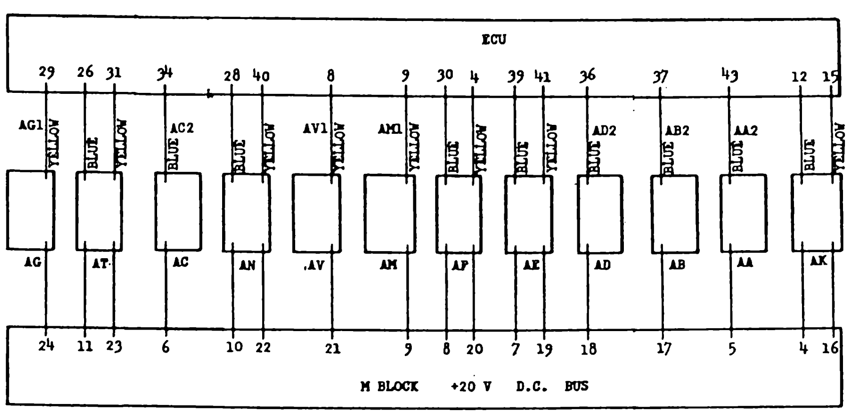


Figure 72

Note that the following is true at all times:

- -The yellow wire from each switch carries the signals labeled with a "1" suffix, such as AG_1, AV_1, etc.:
- -The blue wire from each switch carries the signals labeled with a "2" suffix, such as AT_2, AN_2, etc.:
- -With the Keyboard microswitches in their rest position (plunger in against the switch body), only the blue wires carry current.
- -With the microswitch plungers pulled out, only the yellow wires can carry current.

2 -Adjustments:

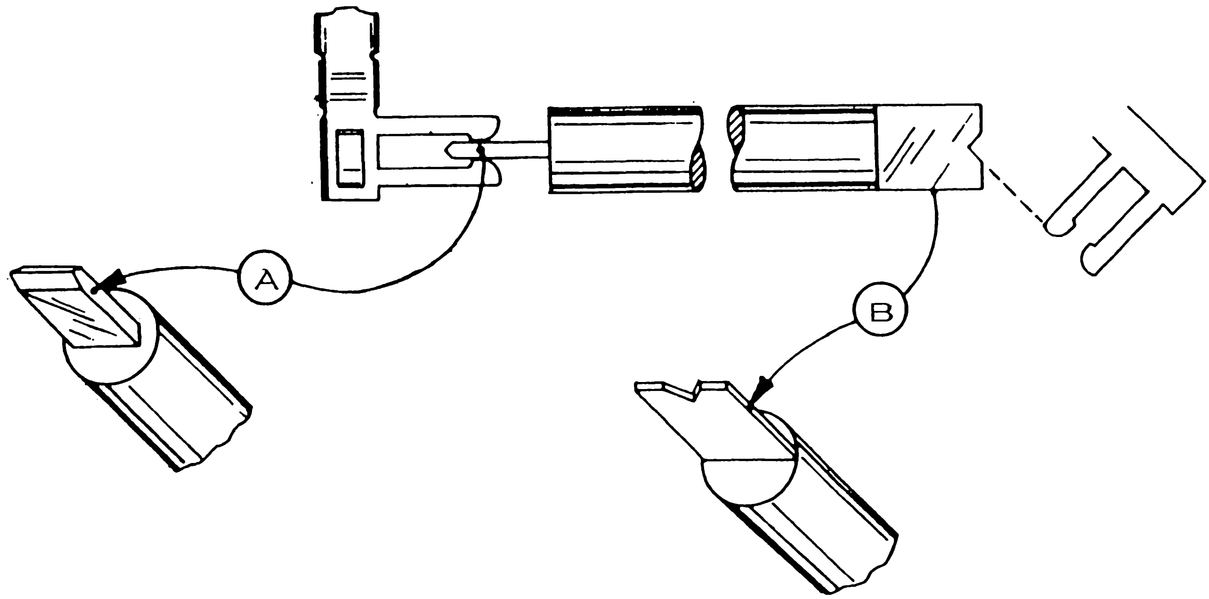


Figure 73

Use end "A" of the Duo-Tyne Contact Tool, part number P101 C, to gauge the contacts in each Nylon Connector Block to ascertain which contacts have separated. Using the other end "B" of the Tool, push gently down upon the upper prong of a spread contact, then use end "A" to test the adjustment. The bending should be done in small increments to avoid ruining the contact and thus creating the additional job of contact replacement.

Should contacts require replacement, Contact Extractor P101 D is used to release contacts from the Nylon Block. Insert the Tool into the bottom of the Block to release the locking tab, and push upward. To replace, simply insert the contact and push home.

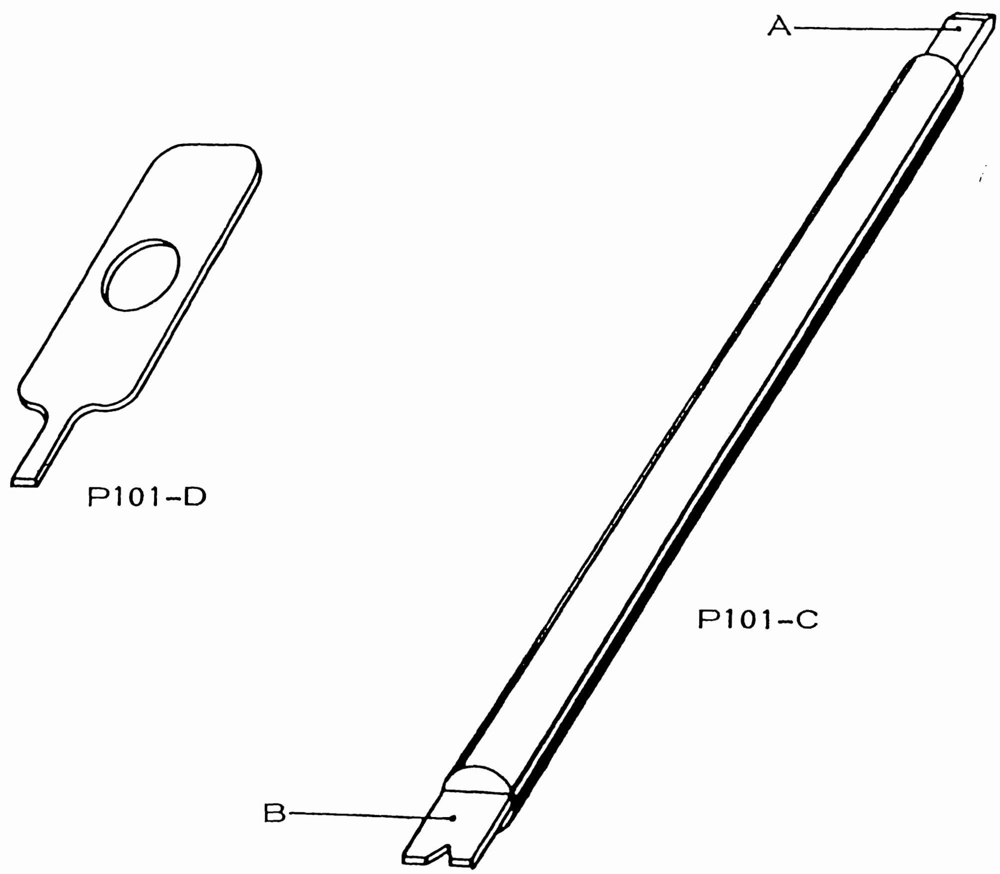


Figure 74

SECTION 8

USE AND CARE OF TRIPLETT METER

USE AND CARE OF THE TRIPLETT VOLT - OHM -MILLIAMETER (VOM) MODEL 310

INTRODUCTION

Analysis of malfunctions in the P101 is largely dependent upon the information gained as the result of VOM readings. It is essential, therefore, that service representatives be familiar with the use and care of the VOM provided them. This meter can be used to measure direct current voltage (DCV), resistance (ohms), DC milliamperes (ma), and alternating current voltage (ACV).

The Range Selector (A), figure 1, is used to select the category of reading desired and also the range of values required within the category. In an arc across the top of the meter, there are scales that correspond to each of the categories of readings as well as sets of numbers representing ranges within those categories. The jacks into which the test leads are inserted for various readings are designated COM, 1200 V DC, 1200 V AC, and V. O. M. (the two 1200 volt ranges are not used in troubleshooting the P101).

The zero-Adjust (B) in the center of the meter is used to align the meter needle with the zero on the left side of the meter dial in preparation for voltage readings. At the top left side of the meter is another dial (not shown) used for aligning the meter needle with the zero of the OHMS scale prior to taking resistance readings.

> Note: Since direct current (ma) readings are not required in troubleshooting the P101, the use of the meter for this application will not be discussed.

OPERATING INSTRUCTIONS

DC VOLTAGE MEASUREMENTS

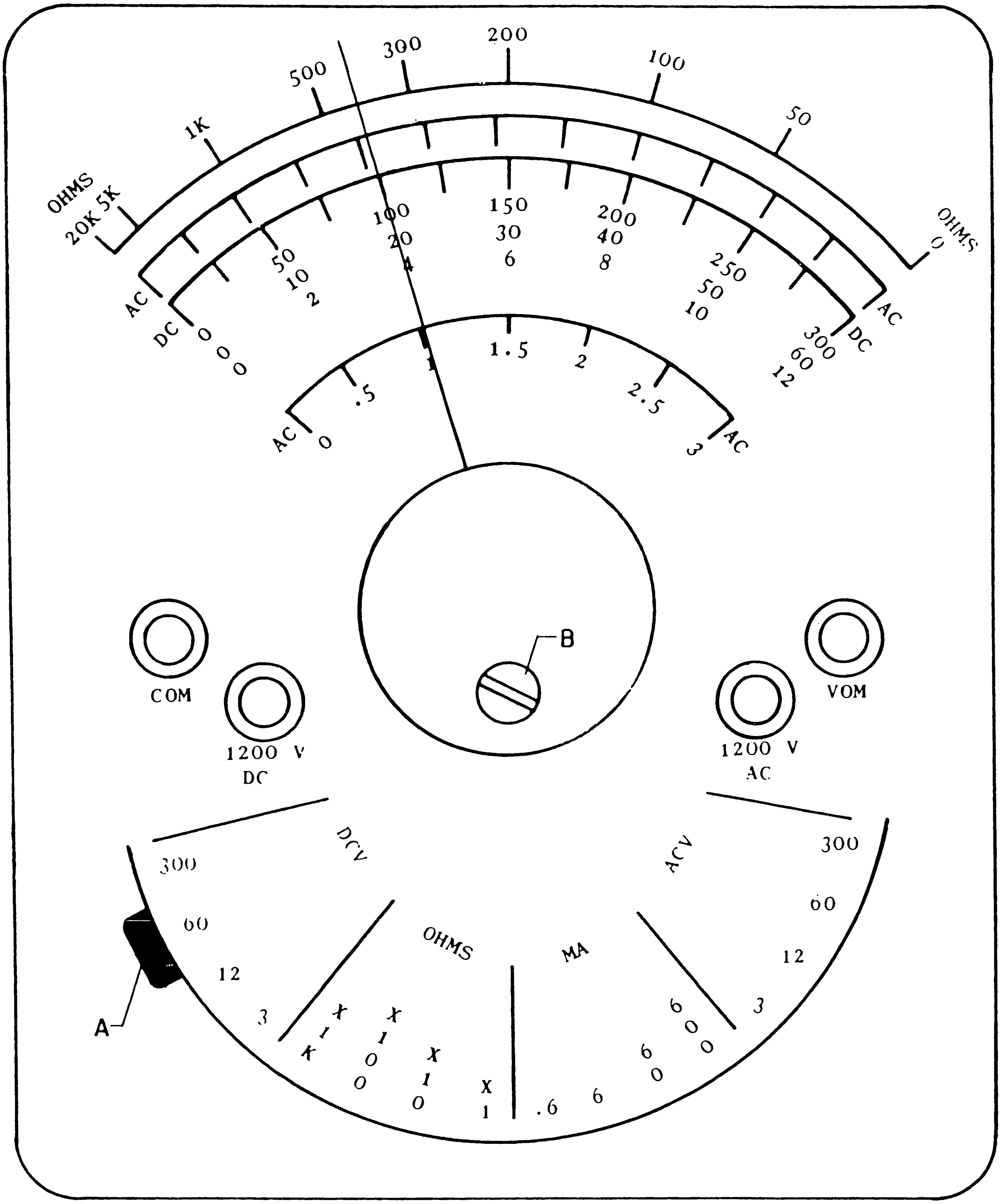
> Note: The procedure below is an example of a DC voltage measurement at the +20 volt Terminal of the P101.

1. Connect the black and red test leads to the COM and V. O. M. jacks, respectively.

2. Rotate the Zero-Adjust (B) until the needle is aligned with the zero mark located at the left of the DC scale. IMPORTANT: In cold weather, the plastic scale cover can retain a static charge that will affect the zero setting. Wipe the transparent cover with a rag moistened in any liquid detergent to avoid this difficulty.

3. Set the Range Selector (A) to the range position you intend to use. Always start with the highest range if in doubt as to the approximate voltage. This will protect the meter against damage from voltages which are higher than expected.

4. Turn on the P101 Power Switch.


OHMS
20K 5K
1K
500
300
200
100
50
OHMS
0
AC
DC
0 0 0
50 10 2
100 20 4
150 30 6
200 40 8
250 50 10
300 60 12
0
.5
1
1.5
2
2.5
3
AC
B
COM
1200 V DC
VOM
1200 V AC
DCV
300
60
12
3
OHMS
X 1 K
X 1 0 0
X 1 0
X 1
MA
.6
6
6 0
6 0 0
ACV
300
60
12
3
A

1

5. Touch black test lead probe to the base of the machine (ground) and the red test lead probe to the +20V Terminal. Since it can be reasonably expected that approximately 20 volts will be present at the connection to be measured, the 60 VDC scale was selected.

6. With the probes in position, find the 60-volt DC scale on the meter dial and read the value indicated. Assume, for this example, that the needle positions as in figure 1. The correct reading would be 20 volts.

   Note: For Range Selector switch positions 12 or 300, read dial values on the associated scales. For Range Selector positions 3, read the dial value associated with the 300-volt scale and divide this by 100 to get the final value.

   CAUTION: Extreme care should be exercised when moving meter test probes. Remember that the power is on. Accidently shorting two connections may result in both meter and ECU damage.

AC VOLTAGE MEASUREMENT

Note: The procedure below is an example of an AC voltage measurement at the AC Terminals of the P101.

1. The black and red test leads should be connected to the COM and VOM jacks respectively.

2. Rotate the Zero-Adjust (B) until the needle is aligned with the zero mark located at the left of the AC scale.

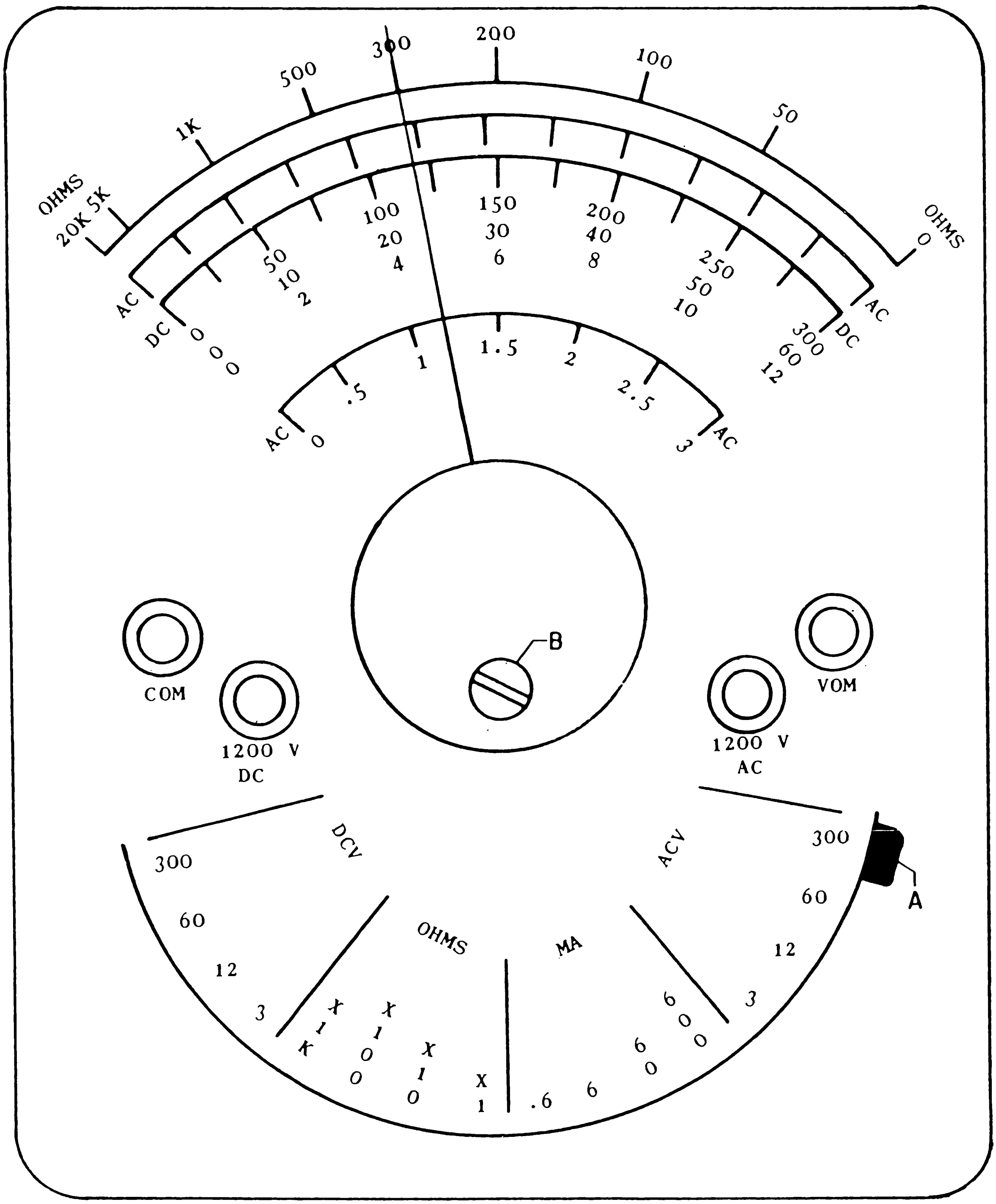
3. Set the Range Selector (A) to the range position you intend to use. Always start with the highest range if in doubt as to the approximate voltage. This will protect the meter against damage from voltages which are higher than expected.

4. Turn on the P101 Power Switch.

5. Place the meter test leads on connections of the AC Terminal. Since it can be reasonably expected that approximately 120 volts will be present at the connection to be measured, the 300 ACV category was selected.

6. Observe the upper red scale (AC) of the meter. The needle, as positioned in Figure 2, indicates a value of 120 volts.

   NOTE: For Range Selector switch positions 12 or 60, read dial values on the associated scales. For Range Selector position 3, the bottom red scale must be used to determine the readings.



OHMS
20K 5K
1K
500
300
200
100
50
OHMS
0
AC
DC
0 0 0
50 10 2
100 20 4
150 30 6
200 40 8
250 50 10
300 60 12
AC
DC
AC 0
.5
1
1.5
2
2.5
3 AC
B
COM
1200 V
DC
VOM
1200 V
AC
DCV
300
60
12
3
OHMS
X 1 K
X 1 0 0
X 1 0
X 1
MA
.6
6
6 0
6 0 0
ACV
300
60
12
3
A

2

RESISTANCE MEASUREMENTS AND CONTINUITY CHECKS

The VOM has internal batteries for making resistance readings and checking continuity. These batteries supply a current which is used by the VOM to measure the resistance of the component or line being checked. Since the power source of the meter is used, the P101 must be turned off when resistance readings and continuity checks are being made.

The top scale (OHMS) is the only one that can be used when determining resistance values. The OHMS range selected by Range Selector (A) should be the one that brings the needle closest to the middle of the top scale. When making continuity checks, the Range Selector (A) should be on the X1 scale.

Zeroing Meter. Before either resistance or continuity is checked, it is necessary to align the meter needle with the zero at the right end of the OHMS scale. To do this, proceed as follows:

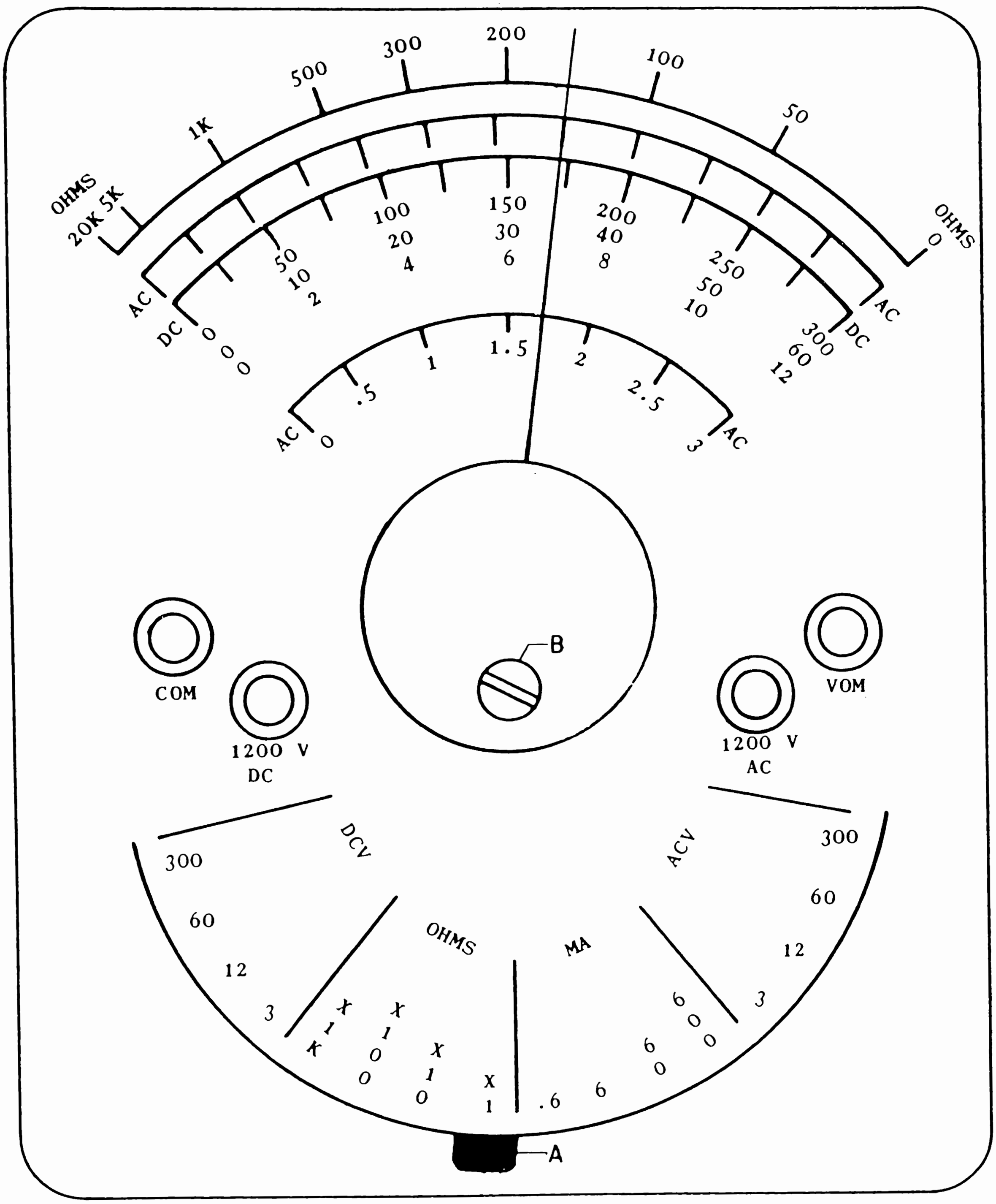
1. Connect the black test lead to the COM jack and the red test lead to the VOM jack.
2. Position the Range Selector (A) to the desired range and touch the test leads together. The needle will deflect sharply to the right.
3. With the needle deflected to the right, position the knob on the upper left side of the meter so that the needle lines up with the zero at the right of the OHMS scale. The meter is now zeroed and ready for use on the range indicated by Range Selector (A). When a different range is selected, the meter must again be zeroed.

Resistance Checks.

1. Place the Range Selector (A) at X1, and zero meter.

   Note: The procedure below is an example of a resistance measurement of the Keyboard Lock Solenoid. The Range Selector (A) for this measurement is placed at X1.

2. Disconnect the power cord and disconnect one of the wires of the Keyboard Lock Solenoid.
3. Place the meter test leads at the contacts of the Keyboard Lock Solenoid.
4. Observe that the meter needle deflects to the right, approximating the position of the needle shown in figure 3 (approximately 150 ohms). (If the meter were zeroed with Range Selector (A) in the X10 range and the needle remained as shown in figure 3, the reading would be approximately 1500 ohms. For X100 and X1K positions, two and three zeroes, respectively, would be added to the indicated value .


OHMS
20K 5K
1K
500
300
200
100
50
OHMS
0
AC
DC
0
0
0
50
10
2
100
20
4
150
30
6
200
40
8
250
50
10
300
60
12
AC
DC
AC
0
.5
1
1.5
2
2.5
3
AC
B
COM
1200 V
DC
1200 V
AC
VOM
DCV
300
60
12
3
OHMS
X 1 K
X 1 0 0
X 1 0
X 1
MA
.6
6
6 0
6 0 0
ACV
300
60
12
3
A

3

Continuity Check

Note: The procedure below is an example of a continuity check of a fuse.

1. Zero the meter with the Range Selector (A) at the X1 scale.

2. Disconnect the power cord and remove the fuse from the fuse holder.

3. Place the meter test leads at opposite ends of the fuse.

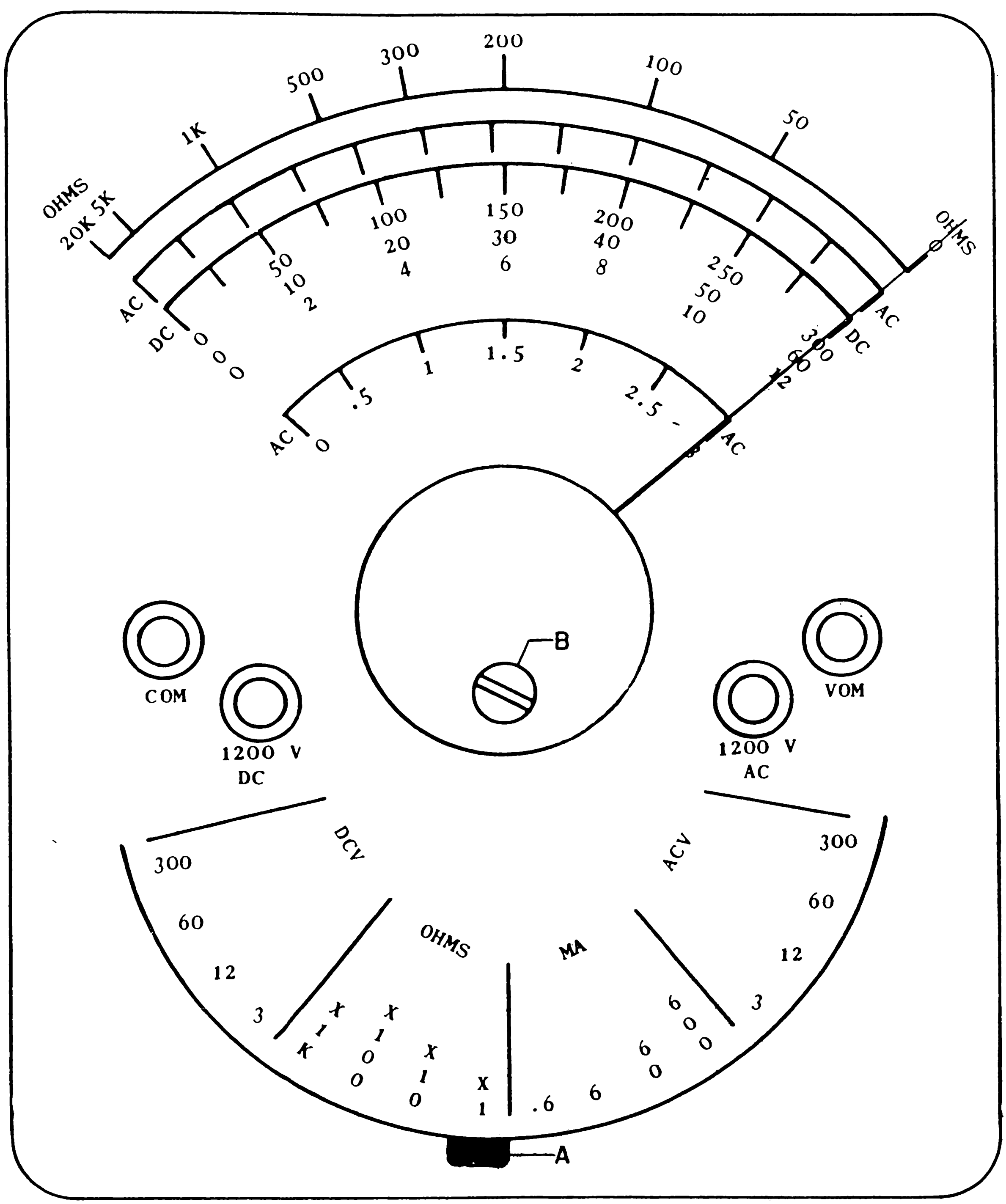
4. The meter needle should deflect completely to the right, indicating almost no resistance (the wire between the points being checked is unbroken). Figure 4 illustrates the needle position when continuity exists.

NOTES ON METER MAINTENANCE

Replacing Batteries: When the ohm ranges X1, X10 and X100 will not zero with the ohms adjust control the 1.5 volt battery should be replaced. If the X1K range will not zero then replace the 15 volt battery. To replace either battery remove the small panel on back of the tester. Watch polarity when replacing batteries and check that terminals have not become corroded due to leakage from old batteries. For longer life, the 1.5 volt battery can be replaced with mercury type Mallory RM 401-R or Eveready E-401-E.

Cleaning the Plastic Windows: The plastic window has been treated at the factory to dissipate static charges. If cleaning is necessary, use cotton dipped in a solution of common household liquid detergent. After cleaning, allow the solution to dry without rubbing; the resultant detergent film will effectively dissipate static charges.

CAUTION: Solvents and liquids used in radio and TV shop work may craze or scar the plastic window if applied to it.


OHMS
20K 5K
1K
500
300
200
100
50
OHMS
0
AC
DC
0 0 0
50 10 2
100 20 4
150 30 6
200 40 8
250 50 10
300 60 12
AC
DC
AC
0
.5
1
1.5
2
2.5
3
AC
B
COM
1200 V
DC
1200 V
AC
VOM
DCV
300
60
12
3
OHMS
X 1 K
X 1 0 0
X 1 0
X 1
MA
.6
6
6 0
6 0 0
ACV
300
60
12
3
A

4